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SUMMARY OF RECENT ABSTRACTS *

VIII. TYPHUS GROUP OF FEVERS †

General

In a discussion of the classification of rickettsiae Weyer (p. 892) gives his opinion that for practical reasons most authors agree in the use of the generic name *Rickettsia* for all the rickettsiae of human disease. *R. quintana* shows extracellular growth in the stomach of the human louse, and is strictly adapted to this louse, and its status as a true rickettsia has therefore been questioned. The author, however, thinks that it deserves a separate place, but among the Rickettsiaceae. He (p. 28) studied the behaviour of various species of rickettsiae in the body louse. All those tested multiplied in the haemolymph and could be passaged by intracoelomic inoculation; most multiplied in the stomach of the louse after rectal inoculation. The differential features found cannot be relied upon for the diagnosis of the various species.

Giroud *et al.* (p. 1064) refer to the group of organisms, related to the rickettsiae, which they call the neo-rickettsiae. These pass through Chamberland L3 candles, have been recovered from domestic animals in many countries, and cause a variety of diseases. They describe the serological reactions of 6 strains.

In dogs from the Marseilles region Placidi and Santucci (p. 1065) found a considerable proportion of older animals positive to *Proteus OXK* and *OX19*, especially the latter. They (p. 1066) found that the Weil-Felix reaction was of little significance in pigs.

In a review of the rickettsial diseases in southern Africa Gear (p. 261) notes that if the Weil-Felix reaction with *Proteus OX2* is positive in higher

* The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1955, v. 52. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

† For previous articles on typhus group of fevers in this series, see the October issues of the *Tropical Diseases Bulletin* each year since 1939.

titre than the reaction with *OX19* the disease is almost certainly tick-borne typhus. Q fever is apparently so prevalent that most adults are immune and persons arriving from north-west Europe are often attacked soon after entering the country.

Babudieri (p. 1178) reviews the serological tests in the rickettsial diseases. The Weil-Felix, though clinically useful, cannot differentiate between several of the diseases, and even the complement-fixation test fails to differentiate Rocky Mountain fever from rickettsialpox, and gives conflicting results with different strains of *R. burneti*. The rickettsia-agglutination test is probably more selective, but is later in development, and costly unless a microscopic modification is used. Roger (p. 29) thinks that crude unpurified rickettsial antigens can be used in complement-fixation tests at titres at which they are still anticomplementary, provided that attention is paid to the haemolytic reactions, and optimum dilutions of antigen and complement are used. With unpurified antigens the whole range of the spectrum of the antigen is retained.

In a test of the effectiveness of various antibiotics in suppressing experimental rickettsial infections in chick embryos Ormsbee *et al.* (p. 887) found that oxytetracycline and aureomycin were consistently effective in delaying the death of the embryos, that thiomycetin (related to chloramphenicol) was generally effective, but was inactive against *R. burneti*, and that erythromycin was effective against *R. prowazeki* and *R. mooseri* but only moderately so against *R. rickettsi* and *R. akari*, and almost ineffective against *R. burneti*. These results may not be exactly reflected in clinical use of the drugs. Tests involving the measurement of nodules produced in rabbits by injecting various rickettsiae intradermally, and the effect on them of various antibiotics, indicated that Spiramycin is about as effective as aureomycin but less so than oxytetracycline (Giroud, p. 624).

Proteus OX19 Type. Vectors: Louse and Flea

MacArthur (p. 524) criticizes a paper in which the suggestion was made that the plague of Athens described by Thucydides was probably measles. He shows that all the recorded data are consistent with louse-borne typhus, and argues convincingly that this was the disease concerned.

An outbreak of louse-borne typhus in Mexico is described by Carrizosa (p. 351) who notes that it occurred in the cold weather.

Bovarnick and Allen (p. 349) found that typhus rickettsiae (Madrid E strain) are damaged by alternate freezing and thawing, but that this damage can to some extent be reversed by incubating them with diphosphopyridine nucleotide (DPN). This reversibility of damage may have an important bearing on the reliability of the determination of the number of viable organisms in suspension or other infected materials. The action of DPN is inhibited by adenosine diphosphoribose, which is one of the products formed when DPN is autoclaved (Rosenberg and Bovarnick, p. 349).

Fuller (p. 29) reports quantitative comparisons of responses of cotton rats and albino mice to measured doses of *R. prowazeki*; the results have a practical value in the estimation by challenge doses of the immunity produced in cotton rats by vaccines.

A study of the heart rate in the different phases of typhus is described by Nicolau *et al.* (p. 1066).

Obál *et al.* (p. 888) report changes in the sugar and chlorides of the cerebrospinal fluid in louse-borne typhus; details are given in the original abstract.

Schaefer *et al.* (p. 962) in America found antibodies of epidemic typhus in 22 per cent. of a group of people born in eastern Europe, but none in a group born in the United States or Canada. They point out that these people may develop Brill's disease, and that caution should be used in diagnosing active typhus in such persons unless a changing antibody titre can be demonstrated. Price (p. 621) succeeded in isolating *R. prowazeki* from 2 persons who had emigrated from Russia to the U.S.A. more than 20 years previously. The problem awaiting solution is the mechanism that causes recrudescence of the illness in human reservoirs of infection. In this connexion Brocard *et al.* (p. 440) report a patient who had an attack of the louse-borne type of typhus but in whom recent infection could be excluded; it seems probable that the patient may have had a latent infection dating from several years earlier, and that the present attack was a lighting-up due to therapeutic shock from treatment with intravenous PAS for pulmonary tuberculosis.

Weyer (p. 887) discusses late relapses in typhus and accepts the orthodox explanation of Brill's disease, especially in view of the fact that *R. prowazeki* has been recovered from the blood of such patients. *R. quintana* can also persist, perhaps for 1–2 years, but there are very few records of recurrence of trench fever several years after the original attack, and in these cases re-infection could not be excluded. Mohr (p. 887) writes to the same effect, pointing out the prolonged period during which *R. quintana* can be detected by xenodiagnosis and the fact that *R. burneti* hardly ever persists in this way.

Wojciechowski and Mikołajczyk (p. 350) show that *R. prowazeki* from louse gut can be inactivated by incubation with chloramphenicol.

Fox and his colleagues (p. 963) have used a live avirulent strain of *R. prowazeki* for immunization of human volunteers, and report that challenge with a virulent strain 2 years later failed to produce clinical effects. On the other hand, challenge 9 months after immunization with a vaccine of the Cox type caused illness in 2 or 3 persons. They (p. 963) used a vaccine consisting of lyophilized yolk-sac material infected with this avirulent strain to inoculate a large number of persons in Peru (where louse-borne typhus is endemic), and they found that immune response occurred in up to 98 per cent. and that the vaccine provided an adequate booster effect in persons who had positive tests when inoculated. A large number of inoculated persons showed immediate or delayed reactions,

usually fever and headache. Later experience in Peru confirms Fox (p. 1179) in his opinion that immunization with a live avirulent strain (E) of *R. prowazeki* is effective. Although complement-fixing antibodies often disappear within a year, neutralizing antibodies and ability to resist virulent challenge have persisted for at least 2 years. The injection should be given intramuscularly and the dose is 4–5 log egg-infecting dose.

Hurlbut *et al.* (p. 137) show that resistance to DDT can be demonstrated in Egyptian body lice.

Mathur (p. 350) reports an outbreak of typhus in India, arguing that it was probably of murine origin, though in comment Megaw inclines to the view that it may have been louse borne, originating possibly from a case of Brill's disease.

Typhus of murine origin is relatively common in Western Australia, especially in Perth and Freemantle, where the incidence is associated with the degree of rat infestation and where Saint *et al.* (p. 352) state that there is strong circumstantial evidence pointing to infection by the inhalation of contaminated dust in rat-infested buildings. In some cases X-ray has revealed pneumonitis. The authors discuss treatment with antibiotics.

Murine typhus is still in evidence in south-west Georgia, U.S.A., especially in the rural population and especially in white persons. Stewart and Hines (p. 137) relate the incidence particularly to farmers and their families.

Cortisone prolongs asymptomatic rickettsaemia in rats, and Pollard and Wilson (p. 889) think that this may simulate a physiological means by which the rat may exert a more sustained role in the dissemination of murine typhus through blood-sucking ectoparasites.

Wattenberg *et al.* (p. 890) injected the toxins of *R. mooseri* intravenously into mice; the flow of blood was slowly decreased, with vasoconstriction and oedema of the tissues.

Red cells treated with material from yolk sacs infected with *R. mooseri* can be agglutinated by homologous antisera. Downs *et al.* (p. 1179) show that agglutination can be prevented by adding beforehand the yolk-sac material to the antiserum, or by adding a heat-stable substance obtained from the tissues of infected animals. It is possible that the presence of this substance may be the basis of useful tests of infection. Schubert *et al.* (p. 29) performed the Weil-Felix test on a series of patients suspected of murine typhus, using various technical methods according to practice in different laboratories; the results showed serious discrepancies, and the authors urge strongly that the serological tests for typhus should be standardized.

Greiff *et al.* (p. 1066) tested the action of derivatives of PABA on *R. mooseri*; none was as effective as PABA, and many were toxic.

Salvin and Bell (p. 1180) found that infection with *Histoplasma capsulatum* in mice conferred a high degree of resistance to *R. mooseri*.

Proteus OXK Type. Vector: Mite

Ogata (p. 1067) gives the history of the discovery of the organism which was first named by him *R. tsutsugamushi* on its discovery in 1927, and claims that this is the valid name. He observes that the name tsutsugamushi means mite disease; it is an old name and denotes that the association with mites has been recognized for a long time.

In an investigation of fever in North Queensland Carley *et al.* (p. 1180) isolated *R. tsutsugamushi* from a number of patients up to the 17th day of illness, and *R. burneti* from a smaller number. They report a study of the strains isolated.

Audy (p. 138) has issued a review of collections of Trombiculid mites in the Asiatic-Pacific area, and their hosts. He points out that the available data may not give an accurate idea of the incidence; for instance collections in the same place a few months apart gave very different pictures of incidence. An account of species of *Trombicula* and *Euschöngastia* found in Borneo is given by Traub and Audy (pp. 138, 139), and an account of the subgenus *Schöngastiella* by Traub and Evans (p. 139). Audy (p. 139) published notes on the taxonomy of Trombiculid mites, with a description of a new genus.

Audy and Harrison (p. 262) give an account of the large collections of animals trapped in Malaya by the Scrub Typhus Research Unit and the relative abundance of Trombiculid mites on them.

Audy and Nadchatram (p. 352) describe a method of rearing individual Trombiculid mites to the nymphal stage for identification.

Harrison (p. 263) argues that if the time spent attached to host by Trombiculid larvae were known it would be possible to estimate their relative abundance, and this is necessary for comparing the effects of different variables such as weather, soil, acaricides and burning on the mites. He has estimated these feeding times by various methods, for a large number of species in Malaya.

Trombicula deliensis, the vector of scrub typhus, was found by Audy *et al.* (p. 964) to be widespread in Manipur and Lower Burma, being most abundant in the rainy season. The chief rodent hosts of this mite are mentioned—*Rattus r. bullocki*, *Bandicota bengalensis* and subspecies of *R. rattus*. Le Gac *et al.* (p. 264) discuss the Trombiculid mites of Indo-China which may be implicated in the transmission of scrub typhus, and describe a new species. A study of the bionomics of *Trombicula akamushi* in Honshu, Japan, is reported by Suzuki (p. 621), who also notes that for protection by impregnation of cloth BHC is more useful than benzyl benzoate and the phthalates. Area control by BHC dusts was effective for about 16 days if a concentration of 5 lb. of active substance per acre was used.

On the basis of collections of mites on small mammals and birds in part of Honshu, Japan, Suyemoto *et al.* (p. 441) conclude that 2 Trombiculids could have qualified as possible vectors in an outbreak of scrub typhus on the basis of seasonal occurrence.

Sato (p. 30) reports some evidence of liver derangement in patients with tsutsugamushi disease. A constant feature was found to be leucopenia, the lowest counts usually being observed during the height of the fever; Terada *et al.* (p. 31) did not find any consistent changes in the red-cell count or the haemoglobin content. These authors (p. 31) found that maximum acceleration of the red-cell sedimentation rate occurred during or soon after defervescence of experimentally inoculated tsutsugamushi disease.

A case of thrombo-arteritis obliterans apparently of rickettsial origin, is reported by Marty *et al.* (p. 889) in a man who had lived in Indo-China and whose serum agglutinated *Proteus OXK* at a titre of 1 in 200.

Prezyna *et al.* (p. 32) treated scrub typhus with chloramphenicol, aureomycin or oxytetracycline; the usual doses were 3 gm. initially followed by 2 gm. after 12 hours. Relapses were fairly frequent but responded to a total dosage of 3–5 gm. or even less. Katsura *et al.* (p. 1181) prefer small doses of antibiotics (*e.g.*, aureomycin) for the treatment of tsutsugamushi disease—100 mgm. daily going on to 50 mgm. daily after a few days—because in this way recrudescences are largely avoided though the illness usually lasts longer than with larger doses. The rapid rickettsiostasis that occurs with the larger doses obviously inhibits the development of immunity. In comment Megaw argues that if the patient's condition indicates actual or threatened tissue damage most medical men would prefer large doses, but that when the fever is controlled the smaller doses could be given for a few days.

In North Borneo Traub *et al.* (p. 32) used dieldrin or aldrin to spray plots of land infested by rats carrying *Trombicula deliensis*; in spite of dense vegetation and heavy rainfall both were effective for several weeks in very greatly reducing the numbers of mites, but dieldrin was the more efficient.

Indeterminate type. Vector: Tick

In Australia Pope (p. 1069) isolated from a patient a rickettsia which was accepted as *R. australis*, the organism of Australian tick typhus, and Neilson (p. 1069) gives an account of the case. The patient apparently became infected by an unidentified tick while picnicking in a known focus of the disease near Brisbane. It was, like others of the same kind, a mild illness.

Mathur (p. 351) describes 3 cases of rickettsial fevers in the Punjab; 2 were probably tick-borne and the third murine. He discusses the reactions with *Proteus OX2*.

Sigalas and Lamontellerie (p. 140) think that *Rhipicephalus sanguineus* plays only a small part in the transmission of boutonneuse fever, and that its chief role is that of a reservoir of infection. Transmission usually takes place from infected dogs (which act as healthy carriers) by actively mobile arthropods which may be mites, fleas, lice,

sandflies, mosquitoes, midges or bugs. Infection by the conjunctival route is considered possible.

A study of Rocky Mountain spotted fever in Maryland is reported by Price (p. 353) who shows that 93 per cent. of the cases in 1931–50 occurred in summer with the peak in July. Before the introduction of antibiotics the average case-mortality rate was about 17 per cent.; it was lower in children and very high in persons over 60. Dogs and field mice appear to be important reservoirs of infection, and attacks are commonly associated with the removal of ticks from dogs. *R. rickettsi* was isolated from *Dermacentor variabilis* in nature. Tick-to-tick transmission is possible through field mice by larval or nymphal forms of *D. variabilis*, and through dogs by adult ticks. Transovarial transmission occurs in ticks.

Price *et al.* (p. 265) describe experiments in which it was found that intraperitoneal injection into guineapigs of virulent *R. rickettsi* which had been inactivated by ultra-violet light protected the animals against challenge with a highly virulent live strain; the degree of protection depended on the ratio of the two doses and not on the previous occupation and monopolization of susceptible tissue cells by the inactivated rickettsiae. Inoculation of the inactivated strain 3 hours after the virulent strain did not confer protection. A protective component was isolated from the supernatant fluid of centrifuged rickettsiae after treatment with sonic vibration, but not from untreated strains.

Parker *et al.* (p. 525) isolated *R. rickettsi* from a lymph gland of a person one year after recovery from an attack of Rocky Mountain spotted fever which was successfully treated with antibiotics. The strain was much less virulent than strains isolated in the original attack, possibly because of long contact with the defence mechanism of the host. The authors comment that other rickettsiae are known to survive for long periods in the body, for instance *R. prowazeki* and *R. tsutsugamushi*. In comment Megaw suggests that loss of virulence through contact with the defence mechanism may explain the extreme rarity of transmission of infection to persons in contact with patients suffering from Brill's disease, though lice can readily be infected by biting such patients.

On inoculation into the rectum or coelom of body lice the rickettsiae of Kenya tick typhus and South African tick-bite fever, though they multiplied, were not seriously pathogenic for the lice; on the other hand the rickettsiae of boutonneuse fever were highly pathogenic. Weyer (p. 525), however, thinks that more work is needed before deciding whether the boutonneuse rickettsiae belong to a different species.

Chang *et al.* (p. 33) describe a study of the erythrocyte-sensitizing substances from rickettsiae of the Rocky Mountain fever group, and show that the haemagglutination test is much more satisfactory than the Weil-Felix test for Rocky Mountain fever and rickettsialpox. In tests of normal persons only occasional false positive results were given, and the titres were low.

Tick-borne typhus occurs in Portugal. Sampaio and Faia (p. 756)

found that the complement-fixation test with antigens of Rocky Mountain fever and rickettsialpox gave better results than the Weil-Felix test. They describe their method of isolating the rickettsia, and Sampaio *et al.* (p. 757) report that the organism was isolated, for the first time, from ticks of the genus *Boophilus*. They think that these ticks may be implicated in transmission. In a study of boutonneuse fever Balducci and Felici (p. 1068) found that most serological tests were negative or feeble except the complement-fixation test with *R. akari* of rickettsialpox. The work supports previous findings that this antigen is indistinguishable from that of *R. rickettsi*, and it seems that a similar close relationship exists with *R. conori*. Weyer (p. 1182) reports a study of a case of Kenya tick typhus contracted from lice infected experimentally from ticks (*Haemaphysalis leachi*) sent to Hamburg from Kenya. The complement-fixation test was positive for Rocky Mountain fever and rickettsialpox in addition to Kenya tick typhus, and definite differential diagnosis between these fevers was not possible by this test.

de Magalhães (p. 264) has demonstrated that oxytetracycline has a dramatic action in the exanthematic typhus of Brazil, but whether it is more effective than aureomycin remains to be proved.

Q Fever

Q fever occurs in the United Kingdom but has not received much attention. Stoker and Marmion (p. 526) give an account of two outbreaks and of other, sporadic, cases. It seems probable that as many as 16 per cent. of all pneumonias and undiagnosed fevers may be due to it, and blood tests in the general population showed 2–4 per cent. of positive results over a wide area. A general account of the epidemiology of the disease is given.

Carrère and Roux (p. 34) found 2 foci of Q fever in animals in the Montpellier region of France, where a few human cases were widely dispersed. Nolden (p. 266) describes an outbreak in Germany. There was no clear indication of its origin, though it may have arisen from sheep in the neighbourhood. An outbreak in Italy was traced by de Filippis (p. 527) to a patient who probably took his infection from a cow and then spread it himself, by droplet from his respiratory tract, among people working in the same factory. In Czechoslovakia the main reservoir of Q fever is domestic stock, and in some herds 80 per cent. of the animals are infected. Raška *et al.* (pp. 354, 757) state that seasonal outbreaks in man occur in association with lambing. The disease is apparently new in that country. Syrůček *et al.* (p. 758) found complement-fixing antibodies in wild birds which live in close contact with domestic stock.

A high proportion (9–18 per cent.) of domestic animals in Egypt gave positive reactions with the complement-fixation test for Q fever, and Elyan and Dawood (p. 890) found the reaction positive in milk from some animals. The rate in man was 2·6 per cent. In complement-fixation or

agglutination tests for Q fever on domestic animals in Persia Rafyi and Maghami (p. 890) found positive results in 43 per cent.

Anderson and Kalra (p. 141), and Kalra and Taneja (p. 142) report Q fever for the first time in man and cattle in India. They also found positive complement-fixation tests in up to 16 per cent. of persons, and up to 11·5 per cent. of domestic stock, in various parts of India. Non-specific reactions for Q fever may be given by Wassermann-positive sera with the Henzerling antigen but not with the Nine-mile antigen. A few positive complement-fixation tests have been found by Soman (p. 266) in a large number of sera examined in Bombay; some positive results were obtained with sheep sera.

A considerable proportion of a large number of samples of blood taken from persons in contact with livestock in various parts of Japan gave positive results with the complement-fixation test for Q fever; apart from a very few cases with suspicious history there was no clinical evidence of the disease (Takano *et al.*, p. 528).

Positive complement-fixation reactions for Q fever were found in only 4 of 1300 sera tested in New Zealand, and Fastier (p. 142) shows that 3 of these persons were immigrants.

Luoto and Mason (p. 891) have used a capillary-tube agglutination test with a stained antigen for detecting Q fever antibody in milk; it had formerly been used successfully with bovine serum and the authors claim that the results with milk are equally reliable. It is easy to perform.

Positive agglutination tests with *R. burneti* were found in Mexico by Varela and Schnaas (p. 143) in 30 per cent. of samples of cows' milk and 15 per cent. of human milk; the use of milk for these tests offers an easy method for epidemiological investigation. Briceño Iragorry and Vogelsang (p. 758) found positive complement-fixation tests in a small proportion of cattle in Venezuela.

An earlier observation by Lennette *et al.* that in a livestock-raising area there was an unexpectedly low frequency of *Brucella* agglutinins in persons whose sera contained complement-fixing antibodies to *R. burneti* led Mika *et al.* (p. 623) to investigate the possibility of an interference phenomenon between *Br. suis* and *R. burneti*. This was found, but it could not be related to demonstrable immunological factors, occurring before *Brucella* agglutinins and rickettsial protective antibodies could be detected.

Abinanti *et al.* (p. 966) found *R. burneti* in tags of wool from the perineal region of sheep after lambing.

Bertrand and Roux (p. 1071) in France isolated a strain of *R. burneti* from a patient suffering from a relapse of Q fever.

R. burneti has been recovered from the urine of infected laboratory animals, and Bock (p. 35) has found pathological lesions in the kidneys, and colonies of the rickettsiae in vacuolated cells of the pelvis of the kidneys. She thinks that the urine of infected animals may be important in transmission of infection by contact, droplet, or dust.

Combiescu *et al.* (p. 355) were able to infect guineapigs with *R. burneti* through the conjunctiva and through the shaved and scarified skin, and Babudieri and Muscovici (p. 1071) were able to infect them by the oral and conjunctival routes, but large doses were necessary. In natural conditions these routes are not likely to be important.

Investigating the transmission of *R. burneti*, Giroud and Jadin (p. 758) found that lice could be infected but were soon killed by the infection, and therefore that survival of the rickettsiae in lice could occur only with attenuated strains. Viable rickettsiae were found in lice fed at various times on a man who had had Q fever, and this experiment demonstrated that the blood became infective from time to time, the rickettsiae being able to survive even during the period of active antibody production.

In Morocco Blanc and Bruneau (p. 965) found *Hyalomma excavatum*, collected from wild rabbits, infected with *R. burneti*, and it seems probable that the rabbits must also have been infected. The only wild mammals hitherto found infected in nature are the bandicoot and the merion; the wild rabbit *Oryctolagus cuniculus* should now be added to the list. The ticks apparently do not play any part in human infection. The same authors (p. 966) remark that only one *Ornithodorus* tick (*Otobius megnini*) has been found infected in nature, but that *O. erraticus* can be infected experimentally. *R. burneti* has also been isolated from species of *Rhipicephalus* in Morocco by Blanc (p. 965), who thinks that it is widespread there although Q fever is rare in man, and no epidemic has been described. He (p. 1070) thinks that the tick is the real reservoir of Q fever, and that natural infection is found in the bandicoot, the merion and the rabbit, which cannot themselves infect man. Domestic animals are also infected, and man acquires the disease from them, especially through inhalation of infected dust—even the dried faeces of infected ticks. In comment Megaw points out that in parts of Africa human infection is rare though the ticks are numerous, and that Gear in South Africa has found widespread immunity in such areas, and that newcomers are attacked by the disease. Infection there is probably common in childhood. [See Gear above, *General*, p. 1197.]

Badiali *et al.* (p. 141) think that the complement-fixation test is more specific than the intradermal test in Q fever. The antigen injected in the intradermal test does not give rise to the production of complement-fixing antibodies when none are there already, but has a tendency to increase the titre of antibodies which already exist. Babudieri (p. 623) recommends both the complement-fixation test (which appears early but is less persistent) and the microscopic rickettsia-agglutination test (which is more sensitive than the macroscopic test).

Tests were made in an outbreak of Q fever in Germany by Herzberg and May (p. 1182); they showed surprising anomalies. In some patients the complement-fixation test was positive with commercial strains of *R. burneti* but not with the homologous strain isolated during the outbreak. In some the rickettsia agglutination test was negative with the commercial

strain but positive with the homologous strain. There is obviously need for caution in interpreting the responses to serological tests in Q fever.

In the direct conglutination test with *R. burneti* the rickettsiae are clumped if sensitized by antibodies in the presence of guineapig complement and bovine-serum conglutinin. Barber (p. 759) found this test much more sensitive than the ordinary agglutination test, but comparable with the complement-fixation test.

In the French Cameroons Porte and Capponi (p. 266) describe an encephalitic syndrome in a child whose serum gave a positive complement-fixation test for Q fever.

Trench Fever

Varela *et al.* (p. 143) from Mexico, for the first time in the Americas, report the presence of *R. quintana*. *Charles Wilcocks*

MALARIA

In this section abstracts are arranged as far as possible in the following order:—Human malaria—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control;* Animal malaria—*monkeys, other animals, birds.*

Eichler, W. Malarialand Griechenland. Eine malariologisch-soziologische Studie. [**A Sociological Study of Malaria in Greece**] *Ztschr. f.d.g. Hyg. u. ihre Grenzgebiete.* Berlin. 1956, Feb., v. 2, No. 1, 67–73.

Wautier, R. Malaria transplacentaire et malaria congénitale. [**Transplacental and Congenital Malaria**] Reprinted from *Scalpel.* 1955, Dec. 24, No. 52, 12 pp.,.1 chart.

The observations recorded in this paper were made at Thysville in the Belgian Congo, about 80 miles south of Léopoldville. The author states that the region in which the town lies is treated with insecticides at frequent intervals, that it is practically free from mosquitoes and that mothers (presumably European) are careful to keep their infants under mosquito nets from birth onwards. He was therefore surprised to find that during a period of 18 months, 12 out of 60 babies from 4 to 12 weeks old developed malarial attacks. In 7 instances parasites were found in the mother's blood before the child was born; in 3 instances no parasites were seen in the mother's blood smear; while in the remaining 2 cases the mother's blood was not examined. The fact that these infants had

malarial attacks at such an early age, although they had been protected by mosquito nets since birth and were in a locality treated by frequent spraying, leads the author to surmise that the attacks were due to infection contracted by the mother before the child was born.

In 5 out of 20 consecutive cases of childbirth in European women, malaria parasites were found in smears taken from the umbilical cord. Among the indigenous population 52 out of 100 women awaiting childbirth were found to have malaria and in 48 cases smears from the cord proved positive.

The author has published this summary of his findings in order to warn his colleagues that a woman arriving in Belgium from the Congo may give birth to a child infected with malaria. He advises that in all such cases smears from the cord should be sent for examination to the Institute of Tropical Medicine at Antwerp. If the infant of a mother recently returned from a tropical country develops convulsions or digestive disturbances, the possibility of congenital malaria should always be borne in mind. *G. Covell*

See also p. 1267, Allison, **Sickle-Cell Anaemia and Haemoglobin C.**

Freyvogel, T. Zur Frage der Wirkung des Höhenklimas auf den Verlauf akuter Malaria. [**Effect of High Altitude Climate on Acute Malaria**] *Acta Tropica.* Basle. 1956, v. 13, No. 1, 1–57, 13 figs. (1 coloured). [28 refs.]

A detailed account—with numerous tables and graphs—is given of an experimental investigation on the effect of the climate of high altitudes upon the course of *Plasmodium gallinaceum* infection in chicks. This work is a continuation of that published previously by workers at the Swiss Tropical Institute [this *Bulletin*, 1953, v. 50, 682; 1955, v. 52, 128].

The experiments were carried out on chicks inoculated with sporozoites of *P. gallinaceum* obtained from *Aëdes aegypti.* Observations were made on infected birds kept (a) in the valley (Basle, altitude 280 m., atmospheric pressure 740 mm. Hg), (b) on the mountain (Jungfraujoch, 3457 m., 490 mm. Hg), and (c) in a low-pressure chamber, the atmospheric pressure of which corresponded to (b). Both in the case of (b) and (c) the chicks were allowed to adapt themselves to the low pressure before inoculation of the parasites. The effect of altitude was studied from the following points of view: (1) adaptation of the erythrocytic system, (2) oxygen saturation of the arterial blood, and (3) course of malarial infection.

No difference was found in the blood changes observed in chicks kept at low atmospheric pressure under natural (on Jungfrau) and artificial conditions (in the chamber), the erythrocyte count, haemoglobin content and colour index being similar in both cases. The oxygen saturation of their arterial blood on the mountain and in the valley was also alike.

Hence it is concluded that the lowered partial pressure of oxygen at high altitudes is not a decisive climatic factor affecting the parasites.

There was also hardly any difference in the course of the malarial infection observed in the valley and in the low-pressure chamber, indicating that the lowered atmospheric pressure is likewise not an important factor. However, it was demonstrated that maintenance of infected chicks at a high altitude had the effect of enhancing the resistance of the reticulo-endothelial system, for the development of EE forms (and hence the prepatent period) was retarded, but this resistance lasted only for a short time, after which the number of EE forms became twice as high as that in birds kept at Basle. The course of the blood infection was also not affected by high altitude, though there was a slight delay in the appearance of the parasites in the circulation, due to the retardation in their EE development. *C. A. Hoare*

Freyvogel, T. Malaria in tiefer und mittlerer Höhenlage. Untersuchungen in endemischen Gebieten Tanganyikas. [**Malaria at Low and Middle Altitudes. Investigations in Endemic Areas of Tanganyika**] *Acta Tropica*. Basle. 1956, v. 13, No. 1, 58–81, 4 figs.

It is known that a sojourn in Alpine resorts has a beneficial effect on European patients suffering from malaria. In order to ascertain whether the same holds good in endemic areas of Africa, and whether the climatic effect of high altitude upon human malaria was comparable to that found in fowl malaria [see above], the author has studied the malaria situation in two endemic localities of Tanganyika, where all the 4 species of *Plasmodium* are present in various combinations of mixed infections. One of the villages in question, Ifakara, lies in a valley at an altitude of 233 m., the other, Kwiro, is situated about 50 km. further south, in a mountainous region at an altitude of 1,000 m.

A comparison of the blood picture in Africans of both localities showed changes at 1,000 m., such as increase in the number of erythrocytes and in haemoglobin content, which were comparable to those observed in Europe at an altitude of 3,457 m. It is therefore assumed that at Kwiro the human organism is affected in the same way by other specific factors due to high altitudes.

Observations on malaria among Africans and white missionaries indicated that its incidence in the mountain village of Kwiro was lower than in the valley at Ifakara. On the other hand, the course of the infections on the mountain was just as severe as in the valley, and moreover they relapsed more often than in the latter. However, from statistical data it is concluded that the lower incidence of malaria at Kwiro cannot be attributed solely to the inferior number of anopheline vectors there, but is due to the fact that the mountain climate increases the resistance of

the human host, especially against the pre-erythrocytic stages of development of the parasite. The observations on human patients are therefore comparable to the findings in the experimental studies on *P. gallinaceum* carried out in Switzerland [see above, p. 1208]. *C. A. Hoare*

Shishlayeva-Matova, Z. S. [**Study of the Size of *P. vivax* Rings for the Differentiation of the Exo-Erythrocytic Generation of the Parasite in the Peripheral Blood**] *Med. Parasit. & Parasitic Dis.* Moscow. 1956, v. 25, No. 2, 146–8. [In Russian.]

In order to ascertain whether the observed variation in the size of ring-forms of malaria parasites was due to the presence in the blood of forms of both erythrocytic and exo-erythrocytic origin, the author carried out the following investigation.

Blood films were made from 95 untreated patients infected with an Uzbekistan strain of *Plasmodium vivax*. In each case the entire film was examined and measurements were made of all the ring-forms seen, which were found to vary from 0·7 μ to 3·9 μ in diameter. While in the great majority of cases (86) only large rings (3–3·9 μ) were present, in some (9) smaller ones (2·5–0·7 μ) were also found. In order to determine whether the smallest parasites were of exo-erythrocytic origin, 8,000 ring-forms were measured in blood films from 47 patients, in which segmentation of the schizonts was taking place. In all but 2 of these cases the minimum diameter of the rings was 3 μ, whereas in the others there were also rings measuring 1·7 μ. There was also a complete correlation between the size of the ring-forms and the merozoites, which measured 2·6 $\times$ 2 μ and 1·7 $\times$ 1·5 μ, respectively. It was thus demonstrated that erythrocytic schizogony produced merozoites of 2 sizes, which gave rise to the large and small ring-forms.

Since the smallest ring-forms, measuring 1·3–0·7 μ, which were seen in 7 out of 95 cases, do not fit into this scheme, it is concluded that they are produced by exo-erythrocytic schizogony. *C. A. Hoare*

Shute, P. G. & Maryon, M. **Is the Malaria Parasite within or upon the Red Blood Corpuscle? With particular reference to the Significance of Stippling and other Morphological Changes observed in the Host Cell.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Mar., v. 50, No. 2, 139–49, 5 figs. (4 on 4 pls.). [12 refs.]

Although it is generally accepted that the malaria parasites are situated inside the erythrocytes, a number of authorities have maintained that they are attached to the outer surface of the host cells. In the present paper the authors advance arguments in favour of the latter point of view. First, they discuss the well-known changes in the red blood corpuscles produced by the 4 species of human *Plasmodium*, and the appearance of the parasites themselves. It is shown that some of the diagnostic features

vary considerably, according to whether they are observed in thick or thin blood films taken from the same patient. Thus, band forms of *P. malariae* and oval or distorted erythrocytes [RBC] infected with *P. ovale*, both of which are common in thin films, are rare or absent in thick films, on account of which they are regarded as artefacts. Stippling can be demonstrated in all the 4 species under suitable conditions, especially when the stain is first applied undiluted (Leishman's and Wright's methods), thereby facilitating absorption by the RBC. To explain the nature of stippling, the authors advance a hypothesis that the malaria parasite is attached to the surface of the erythrocyte, and produces processes which puncture or otherwise damage the host cell, thereby enabling the parasite to feed on its contents. When the film is stained these perforations in the host cell are filled with a deposit of the stain, producing the effect of stippling.

The authors then consider the position of the parasite in relation to the red cell. They note that, in thin films which are kept moist, there are many stippled RBC without parasites, and numerous free parasites. In such cases the host cells appear to be intact, *i.e.*, without any signs of rupture produced by parasites escaping from inside. The inference, therefore, is that the parasites have become detached from the surface of the cells. Further evidence of the extracellular position of the parasites is provided by their appearance in very thin films dried instantaneously. In the case of *P. falciparum* it can be seen that the trophozoites protrude beyond the host cell. In *P. malariae* the band-forms are thought to be produced by distortion of the parasites lying on the surface of the cell in the course of spreading the film; this also explains the fact that elongated forms of *P. ovale* are always stretched in the same direction as the host cell. In films with *P. vivax* showing free parasites, the abandoned RBC show no evidence of damage to their wall. The appearance of the parasites under the conditions described are illustrated in a number of plates.

Finally, since the first effect of mepacrine on the parasites is manifested by disintegration of the pigment, one would expect it to be retained in the RBC, if the parasites were intracellular, whereas in fact it is released into the plasma.

[The case for the intracellular position of malaria parasites is presented in the following paper (see below).] *C. A. Hoare*

Fulton, J. D. & Flewett, T. H. **The Relation of *Plasmodium berghei* and *Plasmodium knowlesi* to their Respective Red-Cell Hosts.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, Mar., v. 50, No. 2, 150–56, 1 diagram & 11 figs. on 5 pls. [27 refs.]

For the study of the position occupied by malaria parasites in relation to the host cell, the authors have used *Plasmodium berghei* and *P. knowlesi*,

which were examined by phase-contrast and electron microscopy. For this purpose, the infected blood (with heparin as anticoagulant) was centrifuged and, after removal of serum, the RBC were suspended in saline and fixed in 2 per cent. osmic acid, after which they were suspended in 70 per cent. alcohol, dehydrated in absolute alcohol and embedded in a mixture of butyl- and methylmethacrylate. After solidification of the plastic, sections from 0·01 μ to 4 μ thick (according to requirements) were cut. For phase-contrast microscopy sections were examined directly with an oil immersion objective, while others were used for electron micrographs.

In preparations examined by phase-contrast microscopy the RBC were globular, and by focusing it could be seen that the parasites were always inside the host cells. Moreover, in mounted preparations treated with xylol the plastic was dissolved, with the result that the infected RBC were streaming in the medium and could be observed from all sides, leaving no doubt that the parasites were intracellular. Likewise, in sections examined by electron microscopy, where the infected RBC and the plane of section were orientated at random, the parasites were invariably situated inside the host cell. The authors "have photographed several hundreds of cells and inspected several thousands on the fluorescent screen of the electron microscope without ever noting any appearance to suggest that a parasite was on the surface of a cell". The intracellular position of the parasites is convincingly illustrated in a series of photomicrographs.

In the course of this investigation, various cytological details of structure of the parasites were also observed.

[The case for the extracellular position of malaria parasites is presented in the preceding paper.] *C. A. Hoare*

Rodhain, J. **Paradoxical Behaviour of *Plasmodium vivax* in the Chimpanzee.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 287–93, 2 figs. on pl.

The first part of this paper gives a useful summary of experiments [see this *Bulletin*, 1950, v. 47, 601] done by the author and others on the effect of inoculating blood forms of *Plasmodium vivax* into the chimpanzee. As a rule the infection fails to take, but occasionally a sub-clinical parasitaemia is the result, lasting up to a month and only detectable by subinoculation of the ape's blood back to man. On one occasion a heavier infection persisted for 9 days, but this may have been due to a relapse of the animal's original *P. schwetzi*. When a very large number of parasites were inoculated intravenously, they were easily detected 5 minutes after infection, but all vanished in 24 hours though a single schizont was found 11 days later, after a prolonged search.

The second part describes experiments in which the infection was transmitted by sporozoites. The first three experiments were unsuccessful

either in producing patent or sub-patent infections, but the fourth gave an interesting result: a 2½-year-old male chimpanzee was injected intravenously with a suspension of sporozoites in Ringer-serum fluid from 25 mosquitoes infected with *P. vivax* (Madagascar strain)—no parasites appeared in the blood during the next 4 months and a man subinoculated with 8 cc. of blood failed to develop benign tertian malaria. The chimpanzee died 9 months after the original injection of sporozoites and pieces of liver were preserved in formalin for further study. This all took place in 1948, and the fixed material was not actually studied until last year and then only for the purpose of observing a concomitant filarial infection from which the animal had also suffered. A large portion of hepatic tissue was examined and 4 exo-erythrocytic schizonts of a malaria parasite were discovered. Three schizonts were oval measuring 49 μ, 61 μ and 81 μ, respectively, in length, while the fourth was a lobulated structure. There were many chromatin masses but no vacuoles. This chimpanzee had previously received an inoculation of blood forms of *P. malariae* and a prolonged parasitaemia followed, but neither this [nor any natural infection by *P. schwetzi*] was likely to have been responsible for the tissue forms found in the liver. The size of the schizonts was larger than those previously described in *P. vivax* or *P. cynomolgi* infections and the author thinks that the larger size may have been due to the prolonged incubation in the liver [but Shortt and Garnham (see this *Bulletin*, 1948, v. 45, 872) and Garnham and Bray (see *Rev. Brasil. Malariol.*, in press) have shown that such " relapse forms " are no different in size from pre-erythrocytic schizonts of 8 days' growth. " Giant " forms over 100 μ occur occasionally in *P. cynomolgi*, and perhaps in an abnormal host growth of the parasite may be slightly different from normal. The two photomicrographs reveal typical exo-erythrocytic parasites of *vivax* type]. These observations support the theory that relapses in malaria originate from schizonts in the liver. *P. C. C. Garnham*

Rodhain, J. Les formes préérythrocytaires du *Plasmodium vivax* chez le chimpanzé. [**Pre-Erythrocytic Forms of** *Plasmodium vivax* **in the Chimpanzee**] *Ann. Soc. Belge de Méd. Trop.* 1956, Feb. 29, v. 36, No. 1, 99–103, 3 pls. (1 coloured).

A male chimpanzee, 4 years old, and suffering from pulmonary tuberculosis, was infected with the sporozoites of *Plasmodium vivax* in the following way under trilene anaesthesia:—

20.12.55. Sporozoites from about 22 *Anopheles* (all infected) were injected into the liver.

20.12.55. Sporozoites from about 35 *Anopheles* (60 per cent. infected) were inoculated intramuscularly.

23.12.55. Sporozoites from about 39 infected *Anopheles* were inoculated intravenously.

23.12.55. Sporozoites from about 13 infected *Anopheles* were inoculated into the liver, with a needle of large bore so that the site of the inoculation could be later detected.

Seven days after the first inoculation the chimpanzee was killed and pieces of liver (including the site of the last injection) were excised and fixed in Carnoy's fluid. Typical pre-erythrocytic schizonts were found in the sections both from the region of the inoculation and from elsewhere. The schizonts lay in the parenchyma and were unaccompanied by any tissue reaction. The forms were round or oval and in one example lobed; vacuoles of different sizes were present in the granular cytoplasm. An empty space separated the parasite from the surrounding tissue, probably as a result of retraction during fixation, and on the edge of this space lay the nucleus of the host cell. The dimensions of the parasites varied from 24 μ to 48 μ. The author attempts to distinguish the 4-day forms (from the December 23rd inoculations) from the 7-day forms (from the December 20th inoculations) by a diameter of less than 30 μ for the former and by the presence of larger (2·27 μ) and less numerous chromatin masses.

This experiment confirms the nature of the tissue forms recently described by the author in a chimpanzee inoculated with sporozoites 9 months earlier [see above, p. 1212]. *P. C. C. Garnham*

Senevet, G., Andarelli, L. & Duzer, A. Études sur les stations à *Anopheles multicolor* des environs de Ténès (Algérie). [**Studies on *A. multicolor* in the Neighbourhood of Ténès, Algeria**] *Arch. Inst. Pasteur d'Algérie*. 1956, Mar., v. 34, No. 1, 119–28, 3 figs. & 2 pls.

This paper is in 3 parts. In the first is given a detailed account (illustrated by maps and photographs) of certain breeding places of *Anopheles multicolor* which were discovered in 1954 in an area in Algeria between Ténès and Orléansville [*Arch. Inst. Pasteur d'Algérie*, 1955, v. 33, 48; this *Bulletin*, 1955, v. 52, (740)]. The fact that larvae could still be found in 1955 shows that the species is established in this zone though no adults have been taken.

Secondly, the morphology of the larva is discussed and the double nature of the conical appendage of the palp is seen to be an aid in distinguishing this larva from those of other species in which this appendage is single. These characters are figured.

Finally, although the spleen and parasite rates recorded in September show that malaria is present, it is not possible to prove that *A. multicolor* is the vector, especially as *A. maculipennis labranchiae* exists nearby. However, it seems probable that *A. multicolor* spends the winter in the adult stage; it must therefore be seriously suspected despite the fact that its role as a vector is generally doubted in other parts of its range.

H. S. Leeson

Adam, J. P. Note faunistique et biologique sur les Anophèles de la région de Yaoundé et la transmission du paludisme en zone forestière du Sud Cameroun. [**Biological Notes on the Anophelines of Yaoundé and the Transmission of Malaria in the Forest Region of the South Cameroons**] *Bull. Soc. Path. Exot.* 1956, Jan.–Feb., v. 49, No. 1, 210–20.

Out of 22 species of *Anopheles* known to occur in the French Cameroons the author found 16 within a radius of 60 kilometres (48 miles) of Yaoundé during investigations in the years 1953, 1954 and 1955. In this paper survey methods are described and results discussed.

Morning catches in dwellings produced, in order of abundance, *Anopheles moucheti, A. gambiae, A. funestus, A. nili, A. wellcomei, A. hancocki* and single specimens of *A. coustani, A. freetownensis* and *A. marshalli.*

In outside catches in mosquito nets the order of frequency was *A. wellcomei, A. coustani, A. moucheti, A. gambiae, A. nili; A. funestus* was not taken outside.

Percentage sporozoite rates were 3·1 for *A. gambiae* (1,047 dissected), 2·6 for *A. nili* (470 dissected), 1·7 for *A. funestus* (522 dissected), and 1·4 for *A. moucheti* (1,586 dissected).

Precipitin tests showed human blood to be present in 370 of 1,396 *A. moucheti*, 23 of 78 *A. gambiae* and 5 of 14 *A. nili*; no figures are given for *A. funestus.*

The mean density per dwelling varied from village to village but maximum figures obtained were *A. moucheti* 37·33, *A. gambiae* 5, *A. nili* 5 and *A. funestus* 3·9. Over the whole area these 4 were the most prevalent species but each was dominant in one or more villages.

After insecticidal treatment [the insecticide is not named] of dwellings in certain villages where *A. nili* and *A. funestus* had been dominant these 2 species disappeared and no larvae of *A. nili* were to be found in the area. Larvae of *A. nili* and *A. funestus* continue to be found in the forest zone. The chief factor preventing malaria transmission by *A. nili* is that few forest villages are situated near the streams, which are avoided by the people for fear of the tsetse fly (*Glossina palpalis*). A factor aiding transmission is the destruction of the forest vegetation barrier to form clearings around the huts, thus making connexion with the breeding places of *A. nili.* Certain valleys also join up with breeding places as also do railway tracks. In one village it was noted that *A. funestus* was breeding in the fish ponds near the houses.

The effect of house spraying on *A. gambiae* was to cause this species to disappear from the houses in the daytime but it continued to be caught in man-baited mosquito traps at night in the open, and larvae were still common in breeding places.

A. moucheti was abundant in those villages where it was being studied because the houses were not sprayed. Transmission by this species is of importance only in certain villages near the breeding places. Adults

have never been found more than 1,200 metres (1,300 yards approximately) from them. It was also observed that the sporozoite infection rate in *A. moucheti* was always higher in the presence of *A. gambiae*.

In comparing the relative importance of these 4 species as vectors of malaria the author concluded that *A. gambiae* was the chief vector in this area of the French Cameroons and that *A. moucheti*, *A. funestus* and *A. nili* were of secondary and local importance only.

Regarding insecticidal treatment, *A. funestus* and *A. nili* are particularly susceptible to house spraying, and *A. moucheti* should be easily dealt with because of its concentration around its breeding places. *A. gambiae* presents a different problem because the spraying seems to introduce changes in behaviour which may be due either to the repellent effect of the insecticide or the existence of different races. *H. S. Leeson*

Halcrow, J. G. **Ecology of** *Anopheles gambiae* **Giles.** *Nature.* 1956, June 16, v. 177, 1103–5.

This is a brief account of a study of the ecology of *Anopheles gambiae* in Mauritius, which was made by a small research unit of the Colonial Insecticides, Fungicides and Herbicides Committee.

In spite of the fact that the large-scale malaria eradication scheme (1948–52) in Mauritius was most successful [this *Bulletin*, 1953, v. 50, 910] the survival of *A. gambiae* was not threatened. This mosquito has even increased in numbers. It is apparent that in Mauritius *A. gambiae* is not the notorious malaria vector that it is in Africa. The species that was eradicated by the 1948–52 scheme was *A. funestus*. The ecological studies show that *A. gambiae* is not a domestic mosquito, and occurs in large numbers in cowsheds, feeding mainly on bovine blood. Deer, monkeys and wild pigs form a wild animal food reservoir. When human blood is taken, this occurs early in the evening and out of doors. The life cycle in summer takes 7 days, in winter 15 days; that of the now extinct *A. funestus* was perhaps three times as long. This short life cycle may have contributed to the survival and rapid spread of *A. gambiae* in Mauritius.

In Mauritius, *A. gambiae* and other mosquitoes reach their peak of activity earlier in the night than in Africa. An early evening exodus from cowsheds of the gravid females was observed.

The gonotrophic cycle in winter extends over 97 hours; in summer it takes 94 hours to complete. Hatching of eggs is delayed during the winter. Egg batches per female are larger in summer. Females which feed on human blood yield more eggs. The early instars can tolerate water containing not more than 17·5 gm./litre of salts (NaCl and $CuSO_4$).

Standing agricultural water forms at least 43 per cent. of the breeding sites. Pupation is greatest in the twilight hours and least during daylight hours.

It was confirmed that *A. gambiae* is a minor vector of bancroftian filariasis in Mauritius; the major vector is *Culex fatigans*.

Some studies on morphology were undertaken. The Mauritian *A. gambiae* showed a maxillary dentitional range of 12–16. The author states that sufficient data were collected on the morphology and biology of the salt-water *gambiae*, "*A. melas* . . . to support the erection of this group to formal sub-specific rank"; these observations will be published elsewhere. [See also this *Bulletin*, 1955, v. 52, 743.]

W. Z. Coker

Bhombore, S. R., Sitaraman, N. L. & Achuthan, C. **Studies on the Bionomics of *Anopheles fluviatilis* in Mysore State, India. II. Bionomics in Western Hill-Tracts, Mysore State.** *Indian J. Malariology*. 1956, Mar., v. 10, No. 1, 23–32. [20 refs.]

The authors worked for 3 years on the bionomics of *Anopheles fluviatilis* in the Western hill-tracts of Hassan District, Mysore State, India, in areas where malaria incidence varied from low to high endemicity.

Three groups of villages, where no insecticide had been used, were selected for study. These groups were situated in zones of low mean annual rainfall (48·23 inches), intermediate (83·19 inches) and high rainfall (223·0 inches) respectively. In all 3 zones there were abundant breeding places of *A. fluviatilis* and high spleen rates were recorded. In an area corresponding to the zone of intermediate rainfall, the town of Saklaspur and some nearby villages, where residual insecticides [unnamed] had been used since 1948, were selected for comparison with the unsprayed villages. Standard entomological methods were used in the survey.

The breeding places of *A. fluviatilis* in the 3 zones are listed and show that out of 9,146 larvae collected, 7,826 (86·5 per cent.) were from running streams with marginal vegetation. Larvae disappear after the beginning of the monsoons and reappear when the rains cease, except in the low rainfall zone where they persist throughout the monsoon period in small numbers.

In all 3 zones collections of adults from catching stations were smaller by night than by day and in both day and night collections more adults were obtained from cattle sheds than from human dwellings. In 5 months' systematic search in the low rainfall zone no adults were collected from outside situations, but 46 were obtained from catching stations. During 9 months only one adult was recorded from a window trap, though others were taken inside the same building. No naturally infected specimens were found. [The number of dissections is not given.] The peak of the feeding period in 2 villages near Saklaspur was between 21·00 and 22·30 hours. The anthropophilic index was low: only 22 out of 656 were positive for human blood and of these 22, 15 were from cattlesheds.

No observations were made on flight range but maximum numbers of

larvae were obtained from breeding places when human dwellings were situated within 2 furlongs. Adults were most abundant in the early part of the year but after April they disappeared from the zones of high and intermediate rainfall until December after the rains stopped. All attempts to found a laboratory colony failed.

In view of the high zoophilic predilection of the species in these 3 zones the authors consider that the critical density must be considerably higher than the 4 per 10 man-hours suggested elsewhere for effective malaria transmission [this *Bulletin*, 1947, v. 44, 798].

Attempts have recently been made to account for the disparity in the various reports about the behaviour of *A. fluviatilis* in different regions. (i) No constant morphological variations have been revealed in adults or larvae. (ii) The repellent effect of residual insecticides has been suggested as responsible for the development of house-avoiding strains. (iii) The possibility of the existence of biological variants must be considered. The authors suggest that their studies support the last contention.

H. S. Leeson

Shama Sastry, H. & Rama Rao, T. S. **Additions to the Records of the Anopheline Fauna of Mandya District, Mysore State, South India.** *Indian J. Malariology.* 1956, Mar., v. 10, No. 1, 33–5.

"By adding *A. barbirostris*, *A. karwari*, *A. philippinensis* and *A. splendidus* to recorded list of anophelines from Visweswariyya Canal area, the list is brought up to date."

[See this *Bulletin*, 1947, v. 44, 16.]

See also p. 1279, Schubert & Holdeman, **A Modified Precipitin Technique for determining the Source of Mosquito Blood-Meals.**

Sergent, Ed. & Sergent, Et. Historique du concept de l'"immunité relative" ou "prémunition" corrélative d'une infection latente. [**Historical Aspects of the Concept of "Relative Immunity" or Correlative "Premunition" in Latent Infection**] *Arch. Inst. Pasteur d'Algérie.* 1956, Mar., v. 34, No. 1, 52–89. [111 refs.]

Reiner, L. & Gellhorn, A., with the technical assistance of Marie Lajtha & Marie Golino. **Localization of Drugs within Cells. Binding of Quinacrine by Liver Cell Constituents.** *J. Pharmacol. & Exper. Therap.* 1956, May, v. 117, No. 1, 52–61, 4 figs. [14 refs.]

World Health Organization. Technical Report Ser. No. 103. **Malaria Conference for the Western Pacific and South-East Asia Regions (Second Asian Malaria Conference), Baguio, Philippines, 15–24 November 1954. Report.** 44 pp. Geneva: 1956, May. [Sales agent for U.K., H.M. Stationery Office.] [1s. 9d.; $0.30; Sw.fr. 1.–.]

The Second Asian Malaria Conference, colloquially known as the Baguio Conference, differs from the First [this *Bulletin*, 1955, v. 52, 3] in its complete acceptance of the eradication of malaria as the ultimate goal of nation-wide malaria control programmes. The report adds as a corollary that it is desirable to interrupt residual spraying of insecticides for malaria control as soon as feasible, *i.e.*, eradication should be pursued as soon as can be. Both eradication and its forerunner interruption present problems and the report gives some indication of how they are to be faced. As a background the population at risk in south-east Asia is reviewed—it amounts to some 278–279 million—together with the extent of control programmes as they were in 1953 when they protected 84 million [this figure is now more than doubled]. A strong national malaria control service is needed but decentralization of executive work is accepted. There is also a need for the enhancement of training facilities, and to coordinate work between the different countries of the region.

Full control has been gained over *Anopheles minimus minimus* by the use of residual DDT in Thailand and China, though it has been slow of attainment in Viet Nam. Previous doubts about the feasibility of controlling malaria carried by *A. minimus flavirostris* by this means have been resolved by experience, though the margin of safety is less than that for malaria transmitted by *A. minimus minimus*. Similar doubts have been felt concerning *A. leucosphyrus leucosphyrus* and, though encouraging reports have been received, the Conference suggested the need for further studies and felt that selective clearing by herbicides and cultivation for the control of *A. leucosphyrus balabacensis* deserved a trial in Borneo. Data about the control of *punctulatus* malaria are still inadequate though promising. The development of resistance to insecticides by *A. sundaicus* in some parts of Indonesia where larvicide has been used has been referred to, and the previous recommendation by the WHO Symposium on the Control of Insect Vectors of Disease that the use of chemically related insecticides against both the adults and the larvae of the same species should not be carried out simultaneously in the same area except in cases of emergency is endorsed. The Report also reviews the state of our present knowledge as it affects problems of south-east Asia under the headings of: entomology, parasitology, therapeutics, control and epidemiology. It analyses the place of drugs as supplements to spraying programmes and in some special situations, and examines critically some comments which have been made on the savings to be effected by malaria control or eradication, the Conference considering that this requires much further work before any definite conclusion can be reached.

G. Macdonald

Kratz, F. W. & Bridges, C. B. **Malaria Control in Turkey.** *Pub. Health Rep.* Wash. 1956, Apr., v. 71, No. 4, 409–16, 5 figs.

The coastlands of both Asiatic and European Turkey with their common high water table and large flood plains provide widespread breeding places for the local vectors of malaria; they enjoy a prolonged summer season in which transmission may occur, and as a result malaria is intense and widely diffused. Similar conditions occur in south-east Anatolia where the foothills decline to the rolling hills of Syria, Iraq and Iran. In the great mountain mass of Asia Minor the warm season is shorter and breeding places are more restricted, with the result that malaria is more localized, but it is commonly severe. The problems are exaggerated by the need for irrigation in many places and by the frequent practice of maintaining outdoor guards on crops for long periods of the year. The vectors are *Anopheles sacharovi* and *A. superpictus*. Three sub-species of *A. maculipennis* (*typicus*, *messeae* and *melanoon*) have also been found and 7 other anophelines: *algeriensis*, *claviger*, *marteri*, *multicolor*, *plumbeus*, *sergenti* and *hyrcanus*. Malaria control comes under the Directorate of Hygiene which previously used a variety of traditional methods with emphasis on drug distribution and survey measures. In 1946 a separate Division of Malaria Control was set up and in the period 1951–1953 it was given aid in the form of staff and materials by the U.S. Economic Co-Operation Administration. DDT residual spraying was extended to protect 9 million people in 12,600 villages by the application of 2 gm. per square metre of DDT to houses, stables, mosques, shops and other shelters [apparently once a year]. Impressive progress is shown in terms of spleen rates and the percentage of malaria admissions among total hospital admissions. No resistance by anophelines has been noted, though it is common in flies, and no ill-effects have been noted among workers. The danger of localized sporadic outbreaks continues so long as chronic carriers and efficient vectors remain. *G. Macdonald*

Chakrabarti, A. K. **Studies on *Plasmodium berghei* Vincke and Lips, 1948. XXII. Effect of Oophorectomy on the Course of Infection in Albino Rats with Blood-Induced Infection.** *Indian J. Malariology.* 1956, Mar., v. 10, No. 1, 17–21. [21 refs.]

" Bilateral oophorectomy in virgin young adult albino rats did not show any significant difference in the course of infection with *P. berghei*, either in peak or in average daily parasitaemia when compared with intact controls. Neither initial splenectomy prior to inoculation nor splenectomy during parasitic latency appeared to have altered or modified the course of infection in oophorectomized animals."

[See this *Bulletin*, 1955, v. 52, 14; 1171.]

Werner, H. Zur Frage des placentaren Übergangs von *Plasmodium berghei* (congenitale Malaria). [**The Problem of Transplacental Penetration by** *Plasmodium berghei* **(Congenital Malaria)**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 1, 64–79, 6 figs. [17 refs.]

In view of the conflicting evidence regarding congenital transmission of malaria, an experimental study of this problem was carried out with female mice and hamsters infected with *Plasmodium berghei* before pairing and at different periods of pregnancy, while new-born mice were inoculated with small numbers of parasites through the tail-tip, with the object of following the course of infection in them. The results were assessed by examination of blood and organ smears, as well as in histological sections, stained by Romanovsky's methods. These are illustrated by photomicrographs.

Altogether 171 new-born and 14 still-born animals were examined microscopically and biologically, and 101 normal foetuses in different stages of development, as well as 34 abnormal ones, were studied in serial sections, but in no case was any evidence of congenital infection detected. However, in some abnormal foetuses with damaged amniotic membranes, parasites had found their way between the serosa and amnion or invaded the amniotic cavity. It is concluded that the erythrocytic forms of *P. berghei* are incapable of penetrating the placental membranes and producing congenital infection of the foetus by that route. *C. A. Hoare*

Celaya, Bettie L., Box, Edith D. & Gingrich, W. D. **Infectivity of** *Plasmodium berghei* **for** *Anopheles quadrimaculatus* **and other Mosquitoes.** *Amer. J. Trop. Med. & Hyg.* 1956, Jan., v. 5, No. 1, 168–82, 5 graphs. [28 refs.]

This paper describes yet another attempt to infect mosquitoes with *Plasmodium berghei*, which like practically all the earlier ones again met with failure. The investigation was far from fruitless, however, because it confirmed the great importance of using early infections for obtaining oöcysts in the gut.

The Kasapa strain of *P. berghei* was used, and the following mosquitoes were tested: *Anopheles quadrimaculatus*, *A. freeborni* and *A. bradleyi*, *Culex fatigans* and *Aëdes aegypti*. Female albino mice (Carworth Farms strain), white rats weighing less than 100 gm. and young hamsters were infected. Mosquitoes were fed on anaesthetized animals and were subsequently maintained at 26°C.

A. quadrimaculatus showed stomach infection rates up to 100 per cent., the oöcysts often numbering several hundred. When mature the size of the oöcyst was from 30–35 μ though some reached 58 μ. Sporozoites were first seen in the oöcyst on the 6th day and were most numerous on the ninth. Then the infection collapsed, the oöcysts shrank and degenerated

with the formation of Ross's black spores, and no sporozoites reached the salivary glands. Mice were the best hosts for providing infective blood—76 per cent. *A. quadrimaculatus* became infected after feeding on mice, but only 35 per cent. after feeding on rats and 33 per cent. on hamsters. The corresponding oöcyst numbers were 39, 6 and 5 per gut. The gametocyte incidence was much the same in all the experiments (from 5 to 9 per 1,000 erythrocytes). Mice survived for 7 or 8 days and then died with a massive infection; mosquitoes were fed on different days during the course of the infection and became infected as follows:— 2nd day, 96 per cent., 3rd day, 87 per cent., 4th day, 41 per cent., 5th day, 10 per cent. In spite of these successes, the sporozoites from the oöcysts proved non-infective, even after inoculation into splenectomized animals and even when large numbers of mature oöcysts and even entire mosquitoes were used.

A. freeborni and *A. bradleyi* showed equally high rates of gut infection, but the glands remained uninvaded.

C. fatigans and *Aëdes aegypti* were refractory to infection.

P. C. C. Garnham

Terzian, L. A., Stahler, N. & Irreverre, F. **The Effects of Aging, and the Modifications of these Effects, on the Immunity of Mosquitoes to Malarial Infection.** *J. Immunology.* 1956, Apr., v. 76, No. 4, 308–13, 3 figs.

Previous papers [this *Bulletin*, 1952, v. 49, 846; 1953, v. 50, 797; 1954, v. 51, 469] showed that the immunity (or susceptibility) of *Aëdes aegypti* to infection with *Plasmodium gallinaceum* was influenced by antibiotics, hormones, vitamins and X-ray irradiation, and this paper considers the effect of the age of the mosquitoes on their susceptibility.

Oöcyst counts on the fifth to seventh day provide the measure of degree of infection for each mosquito. Ageing up to about 4 weeks was found to reduce susceptibility to infection as much as 5-fold. Unpublished work established that mosquitoes kept for 5 weeks on sugar continually excreted nitrogenous materials. This suggested protein depletion as a cause of the enhanced insusceptibility to infection in old mosquitoes. In further experiments, correction of this loss by giving a blood meal to old mosquitoes 7 days before their infecting meal raised their susceptibility to infection above the level in young, control mosquitoes. Results were similar with human and chick blood for this supportive blood meal. If, however, the supportive meal was of separate blood components —plasma, haemoglobin, lysed red cells, or some recombinations of these—susceptibility did not increase but was less than if no meal had been provided before the infecting meal. One per cent. or less of glycine, tryptophan, phenylalanine, and arginine added to a sugar diet had no effect over 4 weeks on the susceptibility of the mosquitoes. But, although little is emphasized about this in the paper, a 4 weeks' diet of raisin infusion greatly increased susceptibility of such old mosquitoes.

In discussion of the results with whole blood and blood fractions, it is suggested that the factor inducing old mosquitos to remain highly susceptible is not simply a replenishment of gross nitrogenous loss by suitable blood feeds but a labile component in whole blood which has no effect in low concentration and is probably closely associated with intact cells. *D. S. Bertram*

TRYPANOSOMIASIS

In this section abstracts are arranged as far as possible in the following order:—African—*human, animal;* American—*Chagas's disease and other trypanosome infections. In each form the following order is followed:*—*epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.*

Tanganyika. Medical Department. **Sleeping Sickness Service Annual Report 1955** [Apted, F. I. C.]. 17 mimeographed pp. & 1 coloured folding map. [1956.]

At the time of writing this report it appeared that the total number of new cases of sleeping sickness in Tanganyika Territory reported in 1955 would be about 200 fewer than in 1954, the totals for the past 3 years being: 1953, 732; 1954, 1,230; 1955, 923.

The disease is now largely occupational as the people in the worst areas live in cleared settlements which give protection at home. Infection is contracted when travelling or hunting, fishing or gathering beeswax. It is noted that many people now report for blood examination on return to the settlement from the tsetse-infested forest.

The sleeping sickness settlements, some of which are now over 30 years old, must be kept in good condition agriculturally so that they can maintain their human and cattle populations. This requires constant vigilance or else the deterioration of a settlement may not be noticed until there has been a sharp rise in the number of cases of sleeping sickness in the area. There are 62 settlements in the Western Province containing about 250,000 people. They were originally created by the Medical Department which had entire responsibility for them, and it is interesting to the present abstracter (who had a hand in the work 25 years ago) to read that they are now the concern of no less than 6 government departments.

The infecting organism is *T. rhodesiense* except in a small area on the shore of lake Tanganyika where *T. gambiense* is the offender. Prophylactic pentamidine has been used here. Clearings are difficult to maintain, and it is hoped to try arboricides in 1956.

The investigation of the dosage of Mel B continues; 49 patients with "incurable" sleeping sickness have now been treated and observed for $2\frac{1}{2}$ to 4 years; 25 were well, 7 had relapsed, 8 had died and 9 had been lost

sight of. Three of the deaths were due to causes other than sleeping sickness. The drug is now advised as the standard treatment for advanced disease, to be used in hospital conditions only. Antrypol continues to be used as the routine treatment for all other cases.

It is hoped to try Puromycin on *T. rhodesiense* infections in 1956, and supplies of the antimony equivalents of the Melarsen drugs are being sought. *H. G. Calwell*

Rhodesia & Nyasaland, Federation of. **Report of the Commission of Inquiry on Human and Animal Trypanosomiasis in Southern Rhodesia** [Thomas, W. E., Chairman]. 115 pp., 2 folding coloured maps. 1955. Salisbury: Govt. Printer.

During 6 weeks the Commission visited many localities in Southern Rhodesia and heard the views and opinions of about 160 persons, some with extensive experience of tsetse and trypanosomiasis elsewhere than in Southern Rhodesia. The report provides a general account of the natural history of the tsetse flies *Glossina morsitans* and *G. pallidipes*, the woodland species which are the vectors of trypanosomiasis in Southern Rhodesia. It deals virtually only with the problems presented by these two species since no importance is attached to *G. brevipalpis* and *G. austeni*, forest species which have made little or no invasion of Southern Rhodesia from the adjacent territory of Portuguese East Africa. A brief history of tsetse and trypanosomiasis in the territory and of control measures since the first abortive attempt at control in 1918 is followed by an appreciation of the present position considered under 4 headings—entomology, parasitology, control and organization.

The essential problem is the methods to be adopted in the future for controlling tsetse, largely *G. morsitans*, in the northern fly belt of some 16,000 square miles and in two much smaller foci in the north-east and the south-east which are at present alarming and dangerous intrusions from Portuguese East Africa. The problem is mainly one of the control and prevention of trypanosomiasis in cattle (besides other domestic animals), since human trypanosomiasis, due to *T. rhodesiense*, occurs only in the northern fly belt and at a very low incidence. However, as regards the human disease, note is taken of the new risks which arise in the proposed development of the Kariba Gorge Dam, where both Europeans and Africans will be working in an endemic sleeping sickness area. Control of cattle trypanosomiasis in the large northern fly belt has been maintained in the past by game destruction at the rate of 30,000 head of game per annum. The report, under the signatures of W. E. Thomas, T. H. Davey, W. H. Potts and the Secretary, G. F. Cockbill, recommends that the present Trypanosomiasis Committee, associated odiously in the public mind with this policy of game slaughter, be renamed and reconstituted and that a Department of Tsetse and Trypanosomiasis Control and Reclamation be created to carry out control measures. The only control

methods recommended for serious consideration in the future are discriminative clearing combined with close settlement and, in some special instances, the trial of insecticides. It is emphasized, however, that until these methods can be shown to be satisfactory for Southern Rhodesian conditions controlled game destruction must continue.

The Commission draw attention to the need for new ideas for de-flying road traffic, as the volume of traffic and larger types of vehicle now coming into use cannot be handled expeditiously by the simple hut methods formerly in use. Improved survey of fly distribution in Southern Rhodesia is also imperative. Although fundamental research on tsetse is adequately covered by West and East African institutes, field application of this research and the testing of principles in terms of Southern Rhodesian conditions should be supported in a generous way and an outlook of scientific enquiry encouraged in the routine of practical reclamation and control.

The first 36 pages of the publication constitute the considered Report of the Commission and the remaining 75 pages give a synopsis of the information obtained from those who appeared before the Commission to state their views. There are two maps, one showing areas of fly infestation and trypanosomiasis and another concerned with the agricultural potential of the country.

[The report is divided into a number of sections, and there are lists of persons and societies who gave evidence, but there is no table of contents or index to the various sections. This makes reference unnecessarily difficult.] *D. S. Bertram*

PARKER, A. H. **Laboratory Studies on the Selection of the Breeding-Site by *Glossina palpalis*.** *Ann. Trop. Med. & Parasit.* 1956, Mar., v. 50, No. 1, 49–68, 4 figs. [13 refs.]

Experiments in Nigeria are described which show that the female *G. palpalis* is influenced in her choice of larviposition sites by both visual and tactile stimuli but not by olfactory stimuli such as might be provided by soil or leaves from natural breeding sites.

The author showed first that a variety of dark objects were attractive; these included even simple black squares provided these were larger than a 9-inch square. He then proceeded, with ingenious and well thought-out combinations of plane surfaces, and, finally, natural objects from tsetse breeding sites, to examine the nature of this attraction; in the course of these observations he showed that soil shaded by wooden screens, a small log or even withered leaves was much more attractive than unshaded soil, but concluded that this attraction was entirely due to the visual effects produced and not to the use of such " breeding site furniture " as perching sites for the larvipositing females. He also demonstrated a preference for shade cast by horizontal rather than by vertical surfaces.

These observations suggested that the act of deposition took place mainly if not entirely on the surface of the soil and not from perching places above, thus agreeing with observations of the majority of other workers [Carpenter, this *Bulletin*, 1912, v. 1, 48; Symes and Southby, *ibid.*, 1939, v. 36, 740; Burtt, *ibid.*, 1953, v. 50, 287].

The response to tactile stimuli was manifested in a preference shown for soil composed of large particles (of 0·10–0·07 in. diameter) over medium (0·04–0·02 in.) and small (0·01 in. and smaller); no discrimination was shown between the last two; the possibility that this choice depended on visual factors was eliminated. Analysis of this response showed that it was due to preference for a rough rather than a smooth surface and not for mobile rather than immobile particles.

The author then turned his attention to temperature, noting that in nature breeding sites were often a few degrees cooler than their surroundings; but he found that no preference was evinced for soils cooled to 3·5°C. or less below an ambient temperature of about 25°C., though soils cooled to a lower degree were avoided; he points out, however, that at an ambient temperature of about 21°C., such as is very often experienced in the field, quite different reactions might be shown. Similarly, no preference for soils damper than their surroundings was observed in the laboratory where the atmospheric humidity was always over 40 per cent., but such a preference might possibly be displayed at humidities around 20 per cent. which are not infrequent in nature during the dry season. Actually, a distinct preference for dry soil (with moisture content of 3 to 3·5 per cent.) over both moderately damp (25 to 27·5 per cent.) and very damp (55–60 per cent.) soil was shown at both 50 per cent. and 80 per cent. relative humidity (at a temperature of about 25°C.).

Finally, direct observations were made on larvipositing females in specially constructed observation boxes. These showed (a) that the deposition of the larva always occurred on the soil surface (37 depositions) and in a shaded area as opposed to an illuminated one; and (b) that these situations were not otherwise preferred resting places for either the pregnant or the " spent " females. In a further experiment with natural breeding site " furniture " in the shape of dead leaves and a strip of old bark, larviposition was again found to be nearly completely confined to the areas shaded by these objects, and again these sites were used by the females only for the act, the average time spent in them being 45 minutes before and 18 minutes after, in the 13 actual depositions of larvae observed.

[This careful and well thought-out study of the behaviour of pregnant tsetse in their larviposition sites, together with the companion study on the behaviour of the larva itself [see below] constitute a valuable advance in our knowledge of this aspect of tsetse behaviour, an aspect which has perhaps so far not been paid the attention it deserves; it is an illustration of the results that may be expected to arise from a combination of laboratory experiment with field experience; any one interested will do well to consult the original accounts.] *W. H. Potts*

Parker, A. H. **Experiments on the Behaviour of *Glossina palpalis* Larvae, together with Observations on the Natural Breeding-Places of the Species during the Wet Season.** *Ann. Trop. Med. & Parasit.* 1956, Mar., v. 50, No. 1, 69–74. [14 refs.]

Experiments in Nigeria are described which show (a) that the larvae of *Glossina palpalis* burrow more readily into soil with large particles and therefore a rough surface than into soil composed of small particles and therefore a smooth surface; (b) and more readily into dry than into damp soil, thus confirming Burtt's observation on the larvae of *G. swynnertoni* [see this *Bulletin*, 1953, v. 50, 287]; (c) that these larvae are photonegative, though the presence or absence of light does not affect their readiness to burrow. This behaviour of the larvae, combined with that of the mother in choosing larviposition sites [see above] is such as to increase the likelihood that the pupae will be situated in a well-protected situation, while the aversion of the larva from burrowing into wet soil tends to prevent pupal mortality through waterlogging. Attempts to discover the wet-season breeding sites produced little evidence of that shift of breeding sites with season that has been discovered by Nash [*ibid.*, 1940, v. 37, 15]; thus in 200 hours of searching only 5 pupae were discovered, in 5 different sites, only one of which was unlikely to be occupied during the dry season; the author, however, considers that some seasonal change in breeding sites must occur when dry season sites become flooded.

W. H. Potts

See also p. 1278, Ovazza; Hamon; Neri; Grenier, Contribution à l'étude des diptères vulnérants de l'Empire d'Éthiopie. I. Culicidae. II. Simuliidae. Simulies et onchocercose. III. Tabanidae. IV. Glossinae. [**A Study of the Biting Flies of Ethiopia: Culicidae, Simuliidae (and Onchocerciasis), Tabanidae, Glossinae**]

Desowitz, R. S. **Observations on the Metabolism of *Trypanosoma vivax*.** *Exper. Parasit.* New York. 1956, May, v. 5, No. 3, 250–59, 1 fig. [26 refs.]

Reusse, U. Konservierung einiger tierpathogener Protozoen durch Aufbewahrung bei tiefen Temperaturen. [**Preservation at Low Temperatures of Protozoa Pathogenic to Animals**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 1, 99–109. [Numerous refs.]

An account is given of experiments on the preservation of various protozoa of veterinary importance at low temperatures, with the object of providing a more practicable method for the maintenance of laboratory strains. The material consisted of (a) citrated infected blood, in the case

of trypanosomes (*T. brucei*, *T. congolense* and *T. evansi*) and piroplasms (*Babesia canis*), (b) peritoneal exudate of infected mice, in the case of *Toxoplasma gondii*, and (c) cultures of *Trichomonas foetus*. To this material was added 30 per cent. glycerol in saline in amounts resulting in up to 15 per cent. final concentration of glycerol. Of each mixture 0·3 to 1·5 ml. was distributed in 2 ml. ampoules, which were sealed and placed in a refrigerator for 30 minutes. They were then placed in 95 per cent. alcohol to which pieces of CO_2-ice were added to produce a gradual cooling of 1°C. per minute until a temperature of −20° was reached, when they were transferred to the deep-freeze (−76°). However, in some cases the ampoules were subjected to rapid freezing at −55° or −20°. Thawing was carried out by immersion of the ampoules in a water bath at 38°: until required for examination, they were either left there or kept in an incubator (37°C.).

The results, which were assessed by microscopic examination of fresh and Giemsa-stained preparations, as well as by animal inoculations or culture, were as follows. After storage at −76°C. the trypanosomes remained viable for 6 months, the canine piroplasms for some weeks, the toxoplasms for only one week, and the bovine trichomonads for 20 weeks. The preservation of the protozoa in question at low temperature is said to be superior to their maintenance by animal passages or culture, owing to the saving of time and material, absence of degeneration and of changes in virulence in the parasites. *C. A. Hoare*

Wiesinger, Dorothee. Die Bedeutung der Umweltfaktoren für den Saugakt von *Triatoma infestans*. [**Importance of Environmental Factors in Relation to Bloodsucking Activity of** *Triatoma infestans*] *Acta Tropica*. Basle. 1956, v. 13, No. 2, 97–141, 20 figs. [Numerous refs.]

A comprehensive and detailed study has been made of the physiology governing the orientation of *Triatoma infestans* at rest and in relation to its host, and of the stimuli resulting in the dual act of piercing and sucking blood.

Introductory details relating to the material used and conditions of maintenance are followed by a section dealing with the conditions under which *T. infestans* selects and remains in its normal resting position. Choice of hiding place appears to be governed by photophobia in combination with the sense of contact (thigmotaxis) leading typically to the selection of dark crevices. The nature of the substratum is important in relation to thigmotaxis, though not intrinsically, and a coarse, dry and solid medium is preferred. Humidity is not in itself a controlling factor in selection of a resting place.

The start of activity is the first stage in a series of responses leading to haematophagy, and is consequent upon a basic overall nocturnal rhythm in the insect, associated with external stimuli. Once initiated, non-directional

activity is fundamentally controlled by thigmotaxis, and other factors have no effect provided the thigmotactic response is possible. Such generalized activity can be modified experimentally as the result of (1) starvation: at suitable intervals of feeding, a normal sequence of activity consists of a short period of intense activity associated with the feeding act, followed by an interval of rest which leads to resumed activity as starvation increases. If feeding is frequent, the rest period is eliminated; (2) light intensity: activity is reduced in strong light; (3) temperature: below 20°C. activity is inhibited. In addition, intense activity is associated with oviposition.

Within the range of perception of stimuli from a vertebrate host, generalized activity becomes directional. Response is to warmth, especially when associated with carbon dioxide (ordinary air currents usually do not stimulate). Experimentally, a warm (36° to 40°C.) 1 to 1 mixture of carbon dioxide and air produced the maximum response, and extension of the proboscis was also achieved by means of high humidity. It is suggested that the initiation of feeding is particularly stimulated under optimum conditions of moist, warm air containing a high proportion of carbon dioxide; this probably accounts for the preference of Triatominae to feed about the face of their host, where exhaled air fulfils these conditions.

A final section of this paper deals with the positions and functioning of the sense organs by which these stimuli are perceived. Temperature perceptors and olfactory organs on the antennae are largely responsible for location of the host, and are mainly directional in function; they also estimate stimuli quantitatively, and under optimum conditions the proboscis is extended. Perceptors at the apex of the proboscis, in conjunction with the antennal organs, are employed in selection of a site for piercing, and functionally can also partly replace the antennae if these are removed. Tarsal sensillae are responsible for the thigmotactic responses, and for orientation of the insect when in contact with the host; the latter function is suppressed by a stimulus resulting from satiation, causing the response to thigmotaxis and photophobia again to become effective. In this way the cycle of activity associated with feeding is completed. *N. R. Phillips*

LEISHMANIASIS

In this section abstracts are arranged as far as possible in the following order:—visceral, cutaneous, muco-cutaneous.

Kirk, R. **African Leishmaniasis.** *Central African J. of Med.* 1956, May, v. 2, No. 5, 199–203. [40 refs.]

The author, drawing on his own wide experience in the Sudan and in East Africa, presents a very informative and readable review and discussion

of leishmaniasis as it is seen in Africa, including the geographical distribution, epidemiology, relation to specific sandfly vectors and the possibility of the existence of some animal reservoir. Readers of this *Bulletin* will be familiar with the records noted, but the author brings together many points of special interest and comments on them.

In Africa the distribution of kala azar is wide and erratic and tends to be rural rather than urban. It is not confined to the poorer sections of the population, and in the Sudan and Kenya predominantly attacks children and young adults rather than young infants.

A distinctive feature of African kala azar has been the outbreaks in military patrols and the explanations of this are discussed. Special reference is made to studies of sandfly vectors and possible animal reservoirs, both in the Sudan and elsewhere. Canine leishmaniasis has not been reported from Sudan or Kenya but the author is not satisfied that its absence from the Sudan has been established.

While many problems relating to the identification and distribution of sandfly vectors and possible animal hosts still await solution, the author points out that post-kala-azar dermal leishmaniasis may provide " an ample but inconspicuous human reservoir ". In any case the problems are probably, and happily, now more academic than practical, since modern chemotherapy has so greatly improved the prognosis of the disease and sandflies in populous areas may be rapidly eliminated by modern insecticides. Only in primitive areas do the problems remain and these areas " are rapidly growing smaller as civilisation speeds apace ".

H. J. O'D. Burke-Gaffney

Appuhn, E. & Weiss, C. Schizogonieformen von *Leishmania donovani* im menschlichen Knochenmark. [**Schizogony of** *Leishmania donovani* **in Human Bone-Marrow**] *Ztschr. f. Tropenmed. u. Parasit.* Stuttgart. 1956, v. 7, No. 1, 93–9, 4 figs.

The authors describe 2 cases of kala azar in Sudanese, in which smears of the bone-marrow, obtained by sternal puncture, revealed a heavy infection with Leishman-Donovan bodies, which occurred chiefly within monocytes, though granulocytes were occasionally also parasitized. In the majority of the host-cells the parasites formed agglomerations, in which the outlines of the individual L-D bodies could be distinguished, but in 5–6 per 1,000 cells the intracellular parasite was represented by a single mass of cytoplasm containing a number of nuclei and kinetoplasts. These forms, which are said to be separated from the contents of the host-cell by a distinct rounded outline, are regarded as individual parasites undergoing schizogony, and it is thought that this rare type of multiple division is associated with unusually heavy infections. The appearance of both the " agglomerations " and " schizonts " is depicted in a number of photomicrographs.

In addition to the parasitological findings, an account is given of the

changes observed in the myeloid elements of the bone-marrow in the patients, which are summarized in a myelogram.

[It is generally recognized that *Leishmania* multiply by repeated binary fission, giving rise to intracellular " agglomerations " of discrete daughter-individuals. However, in imperfectly stained dry preparations these may occasionally fuse, with the result that the outlines of individual parasites become invisible, and they appear as a single body with numerous nuclei and kinetoplasts. This picture has frequently been misinterpreted as multiple division, or schizogony, in *Leishmania*.] *C. A. Hoare*

YELLOW FEVER

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, transmission, pathology, diagnosis, clinical findings, treatment, control.

Trapido, H. & Galindo, P. **The Epidemiology of Yellow Fever in Middle America.** *Exper. Parasit.* New York. 1956, May, v. 5, No. 3, 285–323, 2 figs. [Numerous refs.]

Boshell M., J. El avance de la fiebre amarilla selvática hacia el noroeste de la América Central. [**The Advance of Jungle Yellow Fever towards the North-West of Central America**] *Bol. Oficina Sanitaria Panamericana.* 1956, May, v. 40, No. 5, 400–407.

A general account.

Trapido, H. & Galindo, P. **Genus *Haemagogus* in the United States.** *Science.* 1956, Apr. 13, v. 123, 634.

This brief paper reports the finding of *Haemagogus equinus* in two localities in the State of Texas. Male and female adult specimens were bred from larvae and pupae collected from water in tree holes in the vicinity of the town of Brownsville. The general vegetation of the area was thorn scrub, a situation associated with *Haemagogus*, in the authors' experience, at fairly high altitudes in Mexico.

Although *H. equinus* has not been conclusively shown to be a natural vector of sylvan yellow fever, it was the only species found by the authors in association with an outbreak of this disease in Honduras in 1954, and is known to be capable of transmitting yellow fever virus under laboratory conditions. *N. R. Phillips*

DENGUE AND ALLIED FEVERS

ROWAN, L. C. **An Epidemic of Dengue-Like Fever, Townsville, 1954: Clinical Features, with a Review of the Literature.** *Med. J. Australia.* 1956, Apr. 21, v. 1, No. 16, 651–5. [37 refs.]

In the first 3 months of 1954 a severe outbreak of a dengue-like fever is estimated to have affected some 15,000 of the 40,000 inhabitants of Townsville, North Queensland. A virological and serological study was undertaken and is to be published by O'CONNOR and ROWAN.

The present report is based on descriptions given by practitioners and the author's own observations made on 44 patients, supplemented by the records of the complement-fixation test with dengue type 1 antigen. The clinical findings in the 44 cases are summarized thus:

Clinical Findings	*Incidence*
Pain, retro-ocular	95%
Headache, frontal	90%
Pain in back	87%
Pain in limbs	77%
Taste perversion	75%
Sudden onset	75%
Rash	67%
Pruritus	55%
Temporary remission	44%
Prodromata	25%
Photophobia	12%
Accommodation difficulty	6%
Lymphadenomegaly	Common
Mental depression	Common
Jaundice	1 case
Encephalitis	1 case
Landry's paralysis	1 case
Haematemesis	A few cases

In this epidemic suggestive clinical features were sudden onset, the presence of retro-ocular pain, pain in the back and limbs, perversion of taste and lymphadenopathy in the absence of persisting respiratory symptoms. Positive titres to dengue Type I antigen are recorded.

The relationships of Murray Valley encephalitis, West Nile fever and dengue fever Types I and II are discussed. *Frederick J. Wright*

RABIES

Verge, J. & Placidi, L. Recherches sur le comportement réciproque du virus de Newcastle et du virus rabique fixe inoculés, ensemble ou séparément, dans l'encéphale de la poule et du cobaye. [**Studies on the Reciprocal Behaviour of Newcastle Virus and Rabies Fixed Virus, following their Intracerebral Inoculation, together or separately, into the Hen and the Guineapig**] *Rev. d'Immunologie.* 1956, Apr.–June, v. 20, No. 3, 100–104. [16 refs.]

For their studies on the interaction of these viruses the authors used the brain and spleen of hens, which had succumbed to infection with Newcastle disease virus, and the brain of guineapigs or rabbits, which had died after infection with the classical (Pasteur) strain of fixed rabies virus. These organs were first ground and then the homogenous material was diluted 1 in 20 to provide the necessary tissue suspensions which, after treatment with penicillin and streptomycin, were inoculated intracerebrally in a dosage of 0·2–0·3 cc., either separately or in combination, in the latter case after the 2 different virus-containing suspensions had been mixed in equal parts and kept for 24 hours in the refrigerator. Inoculations were made into hens, both unvaccinated and vaccinated against Newcastle disease virus, and into guineapigs. Results of the various experiments performed may be summarized as follows.

In unvaccinated hens and in guineapigs inoculated with a mixture of the 2 viruses the behaviour of the virus adapted to one species remained unaffected by its contact in that species with the virus not similarly adapted, each virus retaining intact its individual pathogenicity. Thus, for example, unvaccinated hens so inoculated died under conditions identical with those observed in hens inoculated with Newcastle virus alone, while guineapigs inoculated with brain material from the former showed that the rabies virus had undergone no modification by reason of its contact with the Newcastle virus in the hen.

In unvaccinated hens inoculated first with rabies virus and then 15 days later with Newcastle virus, the Newcastle disease certainly developed, but the time required for its evolution was, in general, longer than that observed in the controls. Again, in guineapigs inoculated first with Newcastle virus and then 12–15 days later with rabies virus, rabies developed later than in the controls. The less virulent virus, when inoculated first, would seem, therefore, to impede and delay the evolution of the more pathogenic virus subsequently inoculated.

In vaccinated hens reinoculated with Newcastle virus alone that virus was still demonstrable 14 months later and in fowls inoculated with rabies virus alone a similar persistence of rabies virus had been noted. From vaccinated hens inoculated with a mixture of the two viruses, however, recovery of neither virus proved possible 7 months thereafter. The question is asked whether the disappearance of the Newcastle virus was

brought about by its prolonged contact with the rabies virus. This prolonged contact, which also resulted in the destruction of the rabies virus, was of course rendered possible by the protection against Newcastle virus consequent on vaccination. *G. Stuart*

Schindler, R. Immunisierungsversuche gegen Tollwut mit verschiedenen Impfstoffen. [**Immunization Experiments with Various Rabies Vaccines**] *Ztschr. f. Hyg. u. Infektionskr.* 1956, v. 142, No. 4, 363–70.

Forty dogs were immunized with 1 dose of rabies vaccine and challenged 20–45 days later with an intramuscular injection of street virus; all survived during an observation period of 100–170 days, whereas 22 of 23 control animals died. The following types of vaccine were employed; a 10 per cent. suspension of rabbit brain infected with the Novi Sad strain of fixed virus and inactivated with 1 per cent. phenol; a 10 per cent. suspension of hamster brain infected with the Flury strain; a 10 per cent. chick embryo brain extract, and a 33 per cent. chick embryo extract, both containing the Flury strain. In experiments with guineapigs the Flury embryo vaccines conferred no protection to challenge with fixed virus. No virus could be detected in salivary glands removed from 59 immunized dogs between 14 and 173 days after challenge with street virus. *D. J. Bauer*

Vauck, I. & Laude, T. Bericht über die Tätigkeit der Wutschutz-Abteilung des Robert Koch-Institutes, Berlin, fur das Jahr 1951. [**Report on the Activity of the Department for Rabies Control of the Robert Koch-Institut, Berlin, for 1951**] *Zent. f. Bakt.* I. Abt. Orig. 1956, v. 166, Nos. 3/4, 316–23.

The English summary appended to the paper is as follows: —

"9655 persons visited the department for rabies control in 1951. In the cases of the groups A-D_1 exact statements concerning the patient (kind of possible infection, source of the infection, descent etc.) and concerning the applied vaccinal treatment (tolerance etc.) were made. 4 of the fully treated persons in 1951 died of proved and one patient of very probable lyssa, besides these, two deaths of untreated persons became known. Report on the courses of the affection."

PLAGUE

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, rodent hosts, transmission, pathology, diagnosis, clinical findings, treatment, control.

Loosjes, F. E. **Is the Brown Rat** (*Rattus norvegicus* **Berkenhout**) **responsible for the Disappearance of Plague from Western Europe?** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, June, v. 8, No. 2, 175–8. [20 refs.]

"(1) The brown rat has probably existed in Europe for a much longer time than is generally assumed, without eliminating the black rat.

"(2) Both species inhabit a different biotope and they are only partially competitors for food; competition is probable only in border areas. For the rest, they are regularly found in each other's vicinity, though usually each in its own biotope.

"(3) Environment in the nineteenth century became unsuitable to the black rat because of changes in building methods and materials; this caused the area of the species to decrease markedly.

"(4) In the last few decades the black rat is spreading again. Though it is assumed that this is due chiefly to immigration, there are indications that the existing rat populations are also extending.

"(5) Building methods are changing again, this time in a manner favourable to the black rat, and there are a number of other developments of civilization which promote their extension. This is no doubt the most important reason for the increase.

"(6) If epidemics of plague have really vanished with the black rat, it is imperative that careful study be made of the present increase in the species and if possible an end made of it."

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

Molinari, V. Action du froid sur les trophozoites d'*Entamoeba histolytica*. [**Effect of Cold on Trophozoites of** *Entamoeba histolytica*] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 6, 814–16.

The author describes experiments on the effect of low temperatures upon the trophozoites of *Entamoeba histolytica*. In cultures kept for

3 days at +4°C., the amoebae in some tubes retained their motility but in others became motionless. However, in all cases growth was obtained in subcultures kept in an incubator at +37°C. In cultures kept for 15 minutes at −20° numerous motile trophozoites were present, and continued growing when transferred to an incubator (37°). In cultures which were exposed to −20° for 2 hours and then transferred to +37°, the amoebae survived in two-thirds of the tubes, but were apparently dead in the rest. In another experiment, after remaining for 3 days at +4°, cultures were exposed for 2 hours to a temperature of −20° and then transferred to +37°: at the end of the experiment living amoebae were still present in the cultures.

As a rule the amoebae became rounded at low temperatures but their motility was recovered on transfer to +37°, though in some cases active locomotion was observed even immediately on removal from the freezer at −20°. *C. A. Hoare*

Chaudhuri, R. N. & Saha, T. K. **Liver Biopsy Study in Intestinal Amoebiasis.** *Calcutta Med. J.* 1956, Feb., v. 53, No. 2, 39–43, 6 figs. on 2 pls. [13 refs.]

Needle liver biopsy was done on 15 patients during acute attacks of untreated amoebic dysentery. The liver was slightly enlarged in 9 of these patients; in 4 of them it also was tender. The findings on histological examination of the biopsy material are displayed in a table, and illustrated by photomicrographs. The commonest change was round-cell infiltration of the portal tracts (12 cases); in about half of the cases there was slight, or patchy, fibrosis of the portal connective tissue; parenchymal degeneration or focal necrosis was seen in 8 and in 2 cases respectively; fatty changes in 4; and increase in the size and number ("hyperactivity") of the Kupffer cells in 7 cases. No amoebae were found in any of the biopsy specimens.

The authors think that there are 3 possible explanations of the changes: (1) the liver changes are not due to amoebic invasion; (2) they are, but the causative amoebae are destroyed by the liver; or (3) the lesions are unrelated to the amoebiasis but are due to malnutrition, a low grade bacterial infection, or some other factor. After a brief review of the literature they incline to the last of these explanations. [See also da Silva, this *Bulletin*, 1956, v. 53, 187.] *A. R. D. Adams*

Gambardella, A. & Gentile, L. Amebiasi della cute e del sottocutaneo consecutiva ad intervento operatorio sull'addome. [**Cutaneous and Subcutaneous Amoebiasis following an Abdominal Operation**] *Acta Med. Italica.* 1955, Oct., v. 10, No. 10, 272–7, 3 figs. [34 refs.]

Shafei, A. Z. **A Preliminary Report on the Treatment of Amoebic Dysentery with PAA-701.** *J. Trop. Med. & Hyg.* 1956, May, v. 59, No. 5, 95–9. [10 refs.]

PAA-701 [Camoform (Parke, Davis & Co.)] was used in the treatment of 15 cases of amoebiasis in Egypt; 3 of the patients suffered acute symptoms and the remainder gave a history of recurring dysentery over periods of 3 months to 5 years. The appropriate parasites, in one form or the other, were recovered from each patient, but " Sigmoidoscopy was found superior to careful stool examination in the diagnosis and follow up of cases. Three cases with negative stools had detectable motile amoebae in the mucus aspirated or curetted during sigmoidoscopy ". The treatment given was 1·5 gm. of Camoform daily in 3 doses to totals of 12 to 40·5 gm. in individual cases. There was prompt clinical betterment in all but one patient; diarrhoea stopped in 4 to 14 days; tenderness went in 3 to 7 days; ulceration healed in 5 to 12 days; the stools were negative in 5 to 18 days, though in 3 cases cysts continued to be found in sigmoid aspirate up to 3 months later—repetition of treatment cleared 2 of these. Three patients were not cured; in one, ulceration persisted; in another, the treatment was stopped on account of deterioration in the patient's condition; and the last was not cleared of cysts by 3 courses of treatment. Detailed information is set out in tables.

The blood picture and sedimentation rate, and various biochemical tests, were unaffected by the treatment. In 2 patients with moderate liver enlargement this resolved, though biochemical tests suggested it to be a non-specific hepatitis. No side-reactions resulted from the treatment.

It is concluded that 1·5 gm. daily of Camoform for 14 days cured 14 (or two-thirds) of the patients; repetition of the course after a week's rest raised the figure to " 80 per cent." [of 15 patients]. *A. R. D. Adams*

Milzer, A., Levy, E. & Sokniewicz, W. **Treatment of Intestinal Amebiasis with Bismuth Glycolyl Arsanilate.** *Antibiotic Med.* New York. 1956, Jan., v. 2, No. 1, 42–4.

The authors give the following summary: " Bismuth glycolyl arsanilate [Milibis] given orally was effective in the treatment of chronic, intestinal amoebiasis in 70, or 84·5 per cent, of 83 ambulatory patients. Toxic symptoms and other side reactions were minimal and did not interfere with the completion of therapy."

The dosage was 0·5 gm. by mouth thrice daily for 8 days. The patients suffered only from minor or had no symptoms.

[How often and for how long a period stools were examined after treatment is not stated.] *A. R. D. Adams*

McHardy, G., McHardy, R., Ward, S. & Cradic, H. **A Clinical Evaluation of Novobiocin in Amebiasis.** *Antibiotic Med.* New York. 1956, Apr., v. 2, No. 4, 230–32.

Novobiocin [Albamycin (Upjohn Co.)] is an acid antibiotic recovered from *Streptomyces niveus*, n. sp. It is claimed to show greater amoebicidal action *in vitro* and *in vivo* than that of carbarsone, fumagillin or chlortetracycline, and to be readily absorbed and innocuous. The estimated effective dose for man is 1·5 gm. [presumably by mouth] daily for 10 days. Ten healthy volunteers given this dosage showed no changes in kidney, liver and blood tests throughout or after the course, though there was transient erythema in 2 cases and mild nausea in another. Bigger doses subsequently given to the first 7 patients, after a lapse of 30 days, caused no greater side-effects than these.

Twenty-one patients with *Entamoeba histolytica* infections, 15 of them asymptomatic and 6 with colonic ulceration and diarrhoea ascribed to the infection, were treated with novobiocin. Nine patients had 1·5 gm. daily for 10 days; 4 appeared to be freed of their infections and 5 were not. Four of the latter 5 were then given 2 gm. daily for 10 days; 3 were cleared and one was not. Six patients were given 2 gm. daily for 10 days; 3 of these were not relieved of their infections. These latter 3 were then given 4 gm. daily for 10 days, and this failed to clear one of them. Six other patients with amoebic colitis were given 4 gm. daily for 10 days, and 2 of them were cleared of their physical signs and of their infections; the others were not.

Side effects again were seen in 7 of the 21 patients, chiefly in the form of rashes. These militate against the usefulness of the drug, which on this study did not prove an effective therapeutic amoebicide.

[How many stools were examined and for how long after treatment they were searched for parasites is not stated.] *A. R. D. Adams*

Barghini, G. Un raro reperto di cisti di *Iodamoeba bütschlii* con due corpi iodofili. [**An Unusual Form of** *Iodamoeba bütschlii* **Cyst having Two Iodine-Staining Bodies**] *Riv. di Parassit.* Rome. 1956, Apr., v. 17, No. 2, 123–4, 1 fig. [11 refs.]

RELAPSING FEVER AND OTHER SPIROCHAETOSES

Sparrow, Hélène. Entretien de *Borrelia recurrentis* (souches ethiopiennes) par passages sur souriceaux nouveau-nés. [**The Maintenance of** *Spirochaeta recurrentis* **(Ethiopian Strains) by Passages in Newly-Born Mice**] *Arch. Inst. Pasteur de Tunis.* 1956, June, v. 33, No. 2, 163–80, 5 charts.

The author gives details of the isolation and maintenance of 5 strains of *Spirochaeta recurrentis*, from the high plateaux of Ethiopia. Newly-born mice, 2 to 3 days old, were inoculated either intraperitoneally or under the skin in the dorsal region, with blood containing spirochaetes or the coelomic fluid of infected lice. The inoculated animals usually showed spirochaetes in the circulation after 24 to 48 hours' incubation and these persisted for 48 to 72 hours, rarely more, and disappeared suddenly. Relapses were never observed, and spirochaetes were not found to persist in the organs of the inoculated mice. As a general rule, after a slow start there was a progressive development in the number of spirochaetes appearing in the circulation during successive passages. The spirochaetes on the first day of their appearance in the circulation were more certain to produce infection even if the organisms were scanty. When spirochaetes were due to disappear the inoculation of heavily infected blood was less likely to produce infection. The third day after the inoculation of the newly-born mice was found to be the most favourable time for making subinoculations into other mice. Occasionally after a number of passages the inoculation failed to produce infection, without any obvious reason. The mice did not seem to be affected by the infection. The spirochaetes did not develop in their organs, and there was no difference in the mortality of normal and inoculated animals. The inoculation of the mothers of these mice resulted in the ephemeral appearance of very rare spirochaetes for a few days after the injection.

The organisms maintained by passages in newly-born mice have been shown to remain virulent to man, and 6 patients were inoculated with the blood of infected mice—at the 2nd, 5th, 7th, 8th and 25th passages containing spirochaetes belonging to 3 different strains. Five of the subjects showed typical infections with one or two attacks.

Edward Hindle

Davis, G. E. **The Identification of Spirochetes from Human Cases of Relapsing Fever by Xenodiagnosis with Comments on Local Specificity of Tick Vectors.** *Exper. Parasit.* New York. 1956, May, v. 5, No. 3, 271–5.

Spirochaetes were recovered from 5 cases of human relapsing fever—2 laboratory infections, 2 from the State of Washington and 1 from Idaho—by the injection of the patients' blood into white mice or rats. Subsequently 2 to 4 species of *Ornithodorus* in the first nymphal stage were fed on mice infected with the spirochaete under examination and the ticks tested for infectivity by feeding them on normal mice. Both laboratory infections were of *Spirochaeta turicatae* and were readily transmitted by *O. turicata*. Attempts to transmit one of these strains by *O. parkeri* or *O. hermsi* gave negative results. The Washington strains were both transmitted by *O. hermsi* from Colorado, but not by *O. parkeri*. The Idaho strain was also transmitted by *O. hermsi*, but not

by *O. parkeri* or *O. turicata*. This strain was transmitted by *O. hermsi* from Idaho, California and Colorado, showing that the normal tick vector from widely separated areas was able to transmit the spirochaete. There was no evidence therefore of local specificity of the tick vectors as has been shown in parts of Africa and the Near and Middle East [this *Bulletin*, 1955, v. 52, 453, 454]. *Edward Hindle*

Varma, M. G. R. **The Cotton-Rat as an Experimental Animal for *Spirochaeta turicatae* Brumpt.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 234–7.

The author gives the results of daily blood examination of 6 white mice and 8 cotton-rats, *Sigmodon hispidus*, infected with *Spirochaeta turicatae* either by blood inoculation or the bites of infected *Ornithodorus turicata*. The results with both methods of infection indicate that cotton-rats are more susceptible and therefore more suitable as test animals for this spirochaete. *Edward Hindle*

LEPROSY

In this section abstracts are arranged as far as possible in the following order:—epidemiology, aetiology, pathology, diagnosis, clinical findings, treatment, control.

del Vecchio, G. Profili di lotta contro le malattie sociali. Nota IV. Le recenti provvidenze legislative italiane a favore dei lebbrosi, ricoverati o non, e dei loro congiunti, con brevi cenni alla situazione statistica epidemiologica della lebbra in Italia. [**Outlines of Campaigns against Social Diseases. IV. Recent Italian Legislation for those suffering from Leprosy, whether arrested or not, with a Brief Indication of the Statistical and Epidemiological Situation of Leprosy in Italy**] *Igiene e San. Pubblica.* Rome. 1956, Jan.–Feb., v. 12, Nos. 1/2, 50–63. [13 refs.] English summary (8 lines).

At the end of 1955 there were in Italy 443 patients known to be suffering from leprosy, of whom 193 were in hospitals and 250 at home. There were also records of 213 such patients who had died in recent times. The largest concentration (102) was in Calabria, the second largest (80) in Sicily, and the third (50) in Apulia. Laws which have been recently promulgated provide for more accommodation for leprosy patients especially in rural colonies, and make provision for relatives and other dependants of patients. In 1947 Tobia claimed that there were 364 people with leprosy in Italy, of whom 84 had entered from outside, 175 had acquired the disease in the country, while in 105 the origin of the disease was uncertain. In 1954 Manca Pastorino assessed the number

of leprosy patients at 400, and at the end of that year the number was found to be 434. The measures adopted in other counties for the control and relief of leprosy are quoted, and on the results obtained in these countries the present new regulations are based. *Ernest Muir*

Davey, T. F., Ross, C. M. & Nicholson, B. **Leprosy: a Changing Situation in Eastern Nigeria.** *Brit. Med. J.* 1956, July 14, 65–8.

Up to 1948 the incidence of leprosy in Eastern Nigeria was phenomenally high; for instance a survey of the Abua clan in 1937 showed 492 patients with active leprosy in a population of 14,515 (34 per thousand). The character of the disease was, however, mild, lepromatous cases forming a small minority, and indeterminate cases being common.

Since 1948 a steady reduction has gradually become evident. For example, in one group of villages where work began in 1941 the new cases in the first 3 years were 37, 45 and 71, while in 1952, 1953 and 1954 there were only 8, 10 and 8, respectively. It was possible to maintain a close watch for new cases, and patients cooperated and " came forward for treatment on their own initiative, presenting extremely early lesions ". The question is asked: has there been an epidemic with a rapid decline over a short period of years? This might have resulted from the sudden opening up of the country without corresponding sanitary facilities; the people themselves are of the opinion that leprosy spread rapidly during that period. Leprosy is common among both children and adults, " . . . and the frequency of the unstable indeterminate and borderline varieties of leprosy among the higher age groups is particularly suggestive. It is what one would expect in the earlier stages of an epidemic with all age groups susceptible ".

There is also the possible effect of cross-immunity with tuberculosis but " The impression remains that, even if tuberculosis is having a limiting effect on leprosy in and around ports and townships, its effects in remoter rural areas are not yet sufficient to have contributed much to the decline of leprosy already observed in such areas ".

Another factor to be considered is the improvement in sanitation, standard of living, child health and medical facilities. Then there are the leprosy control measures which were begun about 1935; many local anti-leprosy schemes spread throughout the area from 1938 to 1943, in which entire communities often participated. Over the last 20 years several thousands of patients with the lepromatous type were isolated in settlements in E. Nigeria, and " in Owerri and Rivers Provinces, during the past 15 years approximately 10,000 patients have been isolated for longer or shorter periods in local segregation villages ".

Lastly, there is the effect of sulphone treatment. Since 1949 treatment with oral DDS has gradually been introduced. " Treatment is extremely popular, attracting patients at an earlier stage of the disease

than ever before. Early lepromatous cases speedily become bacteriologically negative. The general public is increasingly leprosy-conscious, and prejudice in localities long resistant to local leprosy control measures has finally succumbed. Relapses hitherto have been unimportant, and there have been no grounds for losing the confident outlook that sulphone treatment engendered ".

While natural regression, the spread of tuberculosis, and the higher standard of living have a part, there is no doubt that the intense and widespread leprosy control work has been of extreme importance, and that its cost to the British taxpayer has entirely justified itself.

Ernest Muir

Brown, J. A. K. **Leprosy and Childhood.** *Central African J. of Med.* 1956, May, v. 2, No. 5, 173–80, 7 figs.

From his experience of leprosy in Uganda and Nigeria the author questions the conclusion that leprosy has any predilection for children. In Southern Nigeria one-third of the patients in settlements were under 15; in the Uganda leprosaria at present 29 per cent. are children. " In one of the larger leprosaria [in Uganda] at a recent examination 225 (36 per cent.) of 631 resident patients had been admitted during childhood, but in this particular district children form about half the population." It is an error to think that susceptibility diminishes with age. " It may be distressing to know that 27 per cent. of the leper population in East Africa is under the age of 20, but it is important to remember that the other 73 per cent. got through their childhood and adolescence safely, only to become infected after reaching maturity." [It is difficult to say how many of the 73 per cent. were infected, though without showing symptoms, before the age of 20. A low child rate is often regarded as a sign that the epidemic is on the downgrade.] The suggestion is made that the more susceptible children are usually those, " one of whose parents had leprosy. Where both parents have the disease the susceptibility is presumably greater still ". [This assumes hereditary susceptibility, but no evidence in favour of this assumption is put forward.]

Ernest Muir

Contreras, F., Guillén, J., Tarabini, J. & Terencio, J. La diferenciación del bacilo de Hansen y de Koch mediante la tinción con el Negro Sudan. [**The Differentiation of** *Myco. leprae* **and** *Myco. tuberculosis* **by Staining with Sudan Black**] *Rev. " Fontilles ".* Valencia. 1956, Jan., v. 4, No. 1, 15–18.

A half per cent. solution in absolute alcohol of Sudan Black B is incubated at room temperature for 48 hours; 7 cc. of this is mixed with 3 cc. of distilled water, shaken and filtered twice. A 1 per cent. aqueous solution of safranine is used as the differential stain. The Sudan Black

is decolorized with acetone. All 51 smears from nose and skin of lepromatous patients were positive with the usual Ziehl-Neelsen stain, but all were negative with Sudan Black, though when restained with Ziehl-Neelsen they all became positive. All of 10 smears from positive tuberculous sputum were found positive with both Ziehl-Neelsen and Sudan Black. It is considered that the use of Sudan Black is a useful differential method for distinguishing between tuberculosis and leprosy.

Ernest Muir

Contreras, F., Guillén, J., Tarabini, J. & Terencio, J. Resultados clínicos e inmunobiológicos en hansenianos adultos vacunados con BCG per vía oral. [**Clinical and Immunological Results in Adult Leprosy Patients vaccinated Orally with BCG**] *Rev. "Fontilles"*. Valencia. 1956, Jan., v. 4, No. 1, 33–8.

Sixteen lepromin-negative leprosy patients (15 of them of the lepromatous type) were vaccinated orally with BCG. The amount given was approximately 0·1 gm. once a week for 3 to 8 weeks, only one patient being given 0·2 gm. In none of the patients was there a change in the lepromin reaction to positive. In a group of 11 of these patients who were suffering from lepra reaction the reaction disappeared permanently except in 2, in whom it became slight and fugitive. With the exception of 1 patient who belonged to the dimorphous group, all the patients improved in general health and wellbeing. Though this improvement may have been due in part to other forms of treatment, it was considered that in some cases it was caused by the vaccination with BCG.

Ernest Muir

Dharmendra & Chatterjee, K. R. **Combined Use of I.N.H. & D.D.S. in the Treatment of Leprosy.** *Leprosy in India.* 1956, Jan., v. 28, No. 1, 3–6.

In a previous article [see this *Bulletin*, 1954, v. 51, 942] the authors reported that isoniazid was of definite value in the first 8 to 12 weeks of treatment, but that after that there was a setback. They suggested its use in combination with sulphones. In this trial 24 patients of the lepromatous type were at first taken, but 2 were not included in the results because treatment was too short. The remaining 22 were treated from 20 to 103 weeks. The dose of isoniazid was 50 mgm. quickly increased to 200 mgm. daily. That of DDS was 25 mgm. slowly raised to 100 mgm. daily. Toxic signs were practically nil, and at least less than with DDS alone. Of the 22 patients 6 showed marked improvement clinically and bacteriologically, 9 showed moderate improvement, and 7 slight improvement. "The combined treatment with INH & DDS appears to be more effective than with either of these drugs alone. It is possible that the addition of DDS delays the development of INH resistant strains of the leprosy bacillus."

Ernest Muir

Tarabini Castellani, G. Hidracida isonicotínica en altas dosis con estreptomicina o aminoacidos azufrados en el tratamiento de la lepra. [**Isoniazid in High Doses along with Streptomycin or Amino-Acids in the Treatment of Leprosy**] *Rev. "Fontilles"*. Valencia. 1956, Jan., v. 4, No. 1, 19–31.

Two series of patients were treated: the first (of 8 patients) with isoniazid and streptomycin with the occasional addition of glutamic acid; the second series of 3 patients with isoniazid and glutamic acid throughout. Details of each patient are given. Glutamic acid was given for its detoxicating effects. Of 7 severe lepromatous cases 3 became permanently bacteriologically negative in the nasal mucosa, but only 1 became temporarily negative in skin examinations. One patient improved only very slightly, probably owing to acquired resistance to isoniazid. Two patients with many bacilli treated with the glutamic acid combination showed temporary improvement, but relapsed again within 60 days. It is considered that while generally speaking the best treatment is with sulphones, there are certain cases which will initially improve better on a combination of isoniazid and streptomycin; but the improvement is only transitory unless it is followed up by sulphone treatment. The maximum daily dose of isoniazid varied from 1,200 to 2,000 mgm. *Ernest Muir*

HELMINTHIASIS

*In this section abstracts are arranged as far as possible in the following order:—*Trematodes *(schistosomes, other flukes);* Cestodes *(Diphyllobothrium, Taenia, Echinococcus, other cestodes);* Nematodes *(Hookworms, Ascaris, Filarial worms, Dracunculus, etc., Trichuris, Enterobius, Trichinella, etc.).*

Müller, Brigitte. Untersuchungsmethoden zum Nachweis von Wurmeiern im Abwasser, an Feldfrüchten und im Erdboden. [**Methods of Examination of Sewage, Crops and Soil for the Demonstration of Helminth Eggs**] *Wasserwirtschaft-Wassertechnik*. 1954, Oct., v. 4, No. 10, 373–5, 2 figs. [15 refs.]

The method of examination referred to in the paper below and devised by the author is described here after an account of the shortcomings of a number of procedures which had been used on the sewage of Leipzig. The method combines the methods of Telemann and of Fülleborn. Special separating funnels (Stammer type) are needed. The funnel of 500 ml. capacity is cylindrical, 62·0 cm. in length, 5·5 cm. in diameter in its upper half. The lower half, which is graduated, is drawn out to be of much smaller diameter, with a terminal stopcock. The stages of the method are:—

(1) 1 litre of sewage is allowed to sediment in 2 funnels for a period of 2–24 hours;
(2) the sediment is drawn off, mixed with 1·0 cc. of ether and 1·0 cc. of concentrated hydrochloric acid, shaken and allowed to stand for 10 minutes;
(3) the mixture is put into 2 centrifuge tubes of 1·7 cm. diameter and is centrifuged for 5 minutes at 2,500 revolutions p.m.;
(4) the supernatant liquid is poured off and to the sediment in each centrifuge tube are added 2·0 cc. of glycerin, 2·0 cc. of saturated sodium chloride solution and the liquid is stirred with a glass rod;
(5) the tubes are centrifuged for 2 minutes at 2,500 revolutions p.m. and
(6) from the surface of each tube, 12 loopfuls (loop of diameter 3·0 mm.) are taken, and placed on microscopic slides and covered by a cover slip. Each cover slip of 18 × 18 mm. size takes 6 loopfuls. Microscopic examination is then carried out.

For the examination of vegetable crops, a hemispherical glass dish with a lip is used in which the vegetable matter is soaked in 1 litre of water for 12 to 24 hours and then washed. The water is filtered through a coarse sieve and then treated in the same way as described for sewage, allowing 6 to 12 hours for sedimentation. Soil can be examined by taking a 20 gm. sieved sample, mixing it with 3 or 4 times its volume of water and allowing the mixture to stand for 2 to 24 hours. After this 1·0 cc. of concentrated hydrochloric acid and 1·0 cc. of ether are added and the mixture is treated like sewage. *M. E. Delafield*

Löliger-Müller, Brigitte. Ergebnisse der Abwasseruntersuchungen im Rieselgebiet Leipzig-Nord und Delitzsch hinsichtlich des Wurmeigehaltes. [**Results of the Examination of Sewage for Helminth Ova in Leipzig-Nord and Delitzsch**] *Gesundheits-Ingenieur*. 1956, Jan. 15, v. 77, Nos. 1/2, 23–4. [11 refs.]

The sewage of Leipzig is given only inadequate treatment before being applied to land for its manurial value. By means of a method of examination devised and published by the author, a considerable variety of helminth eggs derived from human beings and domestic animals were found in the sewage which is being applied to the fields. A table gives the number of ova per litre found in the sewage in the years 1950–54. The list includes *Ascaris lumbricoides*, *Toxascaris* sp., *Toxacara* sp., *Parascaris equorum*, *Trichuris trichiura*, *Enterobius vermicularis*, *Strongyloides*, *Tacnia saginata*, *Taenia solium*, coccidial cysts and thin-walled nematode ova. The presence of helminth ova on the vegetable crops grown on the manured fields was also demonstrated, and it was shown that the ova were able to pass through the pores of the pipes, made of bitumen, which are used for sub-surface irrigation.

M. E. Delafield

Dawood, M. M. **Diagnoses of Cancer Bladder by Cytological Examination of Urine.** *J. Egyptian Pub. Health Ass.* 1955, v. 30, No. 6, 185–92.

Abnormal, as well as normal, epithelial cells commonly are passed in the urines of those with urinary schistosomiasis. The interpretation of cancerous changes in the cells needs special skill and training; the technique of cytological examination of the urine therefore is unsuited to mass survey for determination of the incidence of cancer of the bladder in countries where schistosomiasis is endemic. [See also this *Bulletin*, 1956, v. 53, 770.] *A. R. D. Adams*

Dimmette, R. M., Elwi, A. M. & Sproat, H. F. **Relationship of Schistosomiasis to Polyposis and Adenocarcinoma of Large Intestine.** *Amer. J. Clin. Path.* 1956, Mar., v. 26, No. 3, 266–76, 4 figs. [36 refs.]

The authors have worked with the U.S. Naval Medical Research Unit in Cairo. In Egypt the incidence of polypoid lesions of the sigmoid colon and rectum is high in those suffering from schistosomiasis, and reaches 17 to 20 per cent. of cases. Neoplastic changes in the colon have not, on the whole, been found by various workers to bear an intimate relationship to schistosomal infections, though such changes are said to be frequent in the bladder in association with *Schistosoma haematobium* infection. The authors examined histologically all specimens of carcinoma and of polyposis of the large bowel removed at sundry hospitals in Egypt, and searched particularly for an associated schistosomal infection. Of 237 specimens of benign polyposis 225 were associated with schistosomiasis. Adenomatous hyperplasia was seen in 109 (44·4 per cent.) of these lesions. Of 98 specimens of malignant tumour removed from large intestines 17 were associated with a schistosomal infection; in all but one of them eggs were seen within the neoplastic tissues. The tumours in all cases were single, not multiple, but there were no striking differences between those associated with schistosomiasis and those not so associated. It therefore seems that though benign polyposis may result from schistosomiasis, these lesions do not become malignant; and carcinoma of the large bowel is not a material hazard of this disease.

A. R. D. Adams

Harris, J. W. **Studies on the Mechanism of a Drug-Induced Hemolytic Anemia.** *J. Lab. & Clin. Med.* 1956, May, v. 47, No. 5, 760–75, 7 figs. [42 refs.]

A 28-year-old man from Puerto Rico had received a course of Fuadin 10 years previously. He was treated with Fuadin again and he suffered from nausea, vomiting, haemoglobinuria and jaundice, these being the

results of acute haemolysis. He recovered completely when the administration of Fuadin was stopped. Careful investigations were made of the mechanism by which this haemolysis had been produced. For full details of these, the original paper should be consulted. The patient was considered to have had an acute acquired haemolytic anaemia of the so-called auto-immune-antibody type secondary to drug administration. In the presence of Fuadin (*but not otherwise*) the serum of this patient possessed (a) an erythrocyte-agglutinating activity, (b) an erythrocyte-sensitizing activity, and (c) a haemolytic activity (demonstrable only by the use of erythrocytes from a case of paroxysmal nocturnal haemoglobinuria or trypsinized normal erythrocytes). The agglutinin could be passively transferred to a normal person, but its recognition required the presence of Fuadin. The findings in this case are considered to have important implications for the understanding of drug sensitization.

F. Hawking

Jackson, J. H. **Bilharzia: the Necessity for Control Measures on Irrigated Estates: the Importance of a Planned Irrigation System in the Biological Control of the Snail Vectors in Areas where the Topography is suitable and Site Selection is possible.** *Central African J. of Med.* 1956, Apr., v. 2, No. 4, 139–48, 1 map. [17 refs.]

In Africa the increasing use of irrigation and water conservation is tending to disseminate schistosomiasis even more widely, and this infection has become firmly established in many areas, including some where it did not formerly exist.

Irrigation schemes infer irrigated estates which require a labour force; this may be recruited from scattered sources remote from the estate and members of it may or may not be infected with the schistosome. The aggregation of workers with or without families in a countryside where surface waters are heavily infested with snails is fraught with danger to the health of the community.

This fact is not obvious to employers and estate managers in general. Schistosomal infection is chronic, silent and insidious, debilitating affected persons over the years; so insidious, indeed, that doubt has been cast on the view that it is a serious hazard to health, an opinion based on the familiar expression that a mutual tolerance exists between host and parasite. This view, expounded to the lay administrative public, provides a very useful argument against the implementation of field measures of control. It is of little avail to rely on the average African's views of schistosomiasis, as his conception of physical fitness is that of a compromise with chronic disease and infection; often in one person there is superimposed on basic malnutrition infection with malaria, hookworm, round worm, tapeworm and schistosomiasis, both *S. haematobium* and *S. mansoni* in some instances.

The crux of the situation lies in two factors: (i) repeated exposure of

a hitherto lightly infected person to a heavily contaminated water is likely to result in a progressive increase in the worm load, particularly if there is already some debility from poor diet or other disease; (ii) exposure of a non-immune or uninfected person to a heavily contaminated water is likely to result in the immediate acquisition of a heavy infection or worm load against which there is little defence.

The author summarizes the well known methods of control and concludes that, in the absence of an efficient specific drug for mass treatment, the existence in Africa of a widely infected, backward, indigenous population dictates that the primary attack must be against snails supported by the prevention of contamination of surface waters. He describes how biological control of snail populations occurs in rivers and streams of Central Africa and how irrigation projects interfere with this, *e.g.*, the construction of a weir. An irrigation system from such a heavily infested lake acts as a trap for snails and in the sluggish, weedy waters of the system conditions are ideal for snail breeding.

The author advocates, in the planning stages of irrigation systems, that, although the open canal and ditch irrigation is the cheapest method, consideration should be given to (i) closed concrete pipes for the permanent distribution and (ii) overhead spray irrigation. For "open" systems he enumerates certain principles for the guidance of water engineers:

(i) Intake weirs: Expanses of water should be obviated but, if this is not possible, control of water level should be arranged by lock-gates; recession of water from the lake edge or complete emptying permits of the control of the vegetation on which snails thrive.

(ii) Canals and channels should be deep rather than wide and graded to permit a flow approaching 2 feet per second.

(iii) Changes of level and direction of water must involve measures of permanent construction designed to avoid scour-holes, wash-outs and side pools.

(iv) Land to be laid out for irrigation by *intermittent* side-flow channels. Snail-lodgment sites in waterlogged places must be avoided.

(v) Where storage reservoirs are essential construction should permit complete drying-out of the reservoir and intake channel about once in 4 weeks. The floor of the reservoir needs a herring-bone system of channels to facilitate drainage and drying or the application of molluscicides.

(vi) After construction, maintenance is essential to ensure free-water flow by control of vegetation, the absence of seepages, side pools and scour-holes. Periodic checks are necessary for the location of snail-lodgment sites and the application of molluscicides. Periodic emptying of canals and exposure to the heat of the sun is an effective means of killing the bulk of a snail population.

R. Ford Tredre

Barbosa, F. S. & Coelho, M. V. Qualidades de vetor dos hospedeiros de *S. mansoni* no nordeste do Brasil. 1° Suscetibilidade de *A. glabratus* e *T. centimetralis* à infestação por *S. mansoni*. [**Vector Characters of Hosts of** *Schistosoma mansoni* **in North-East Brazil. I. Susceptibility of** *Australorbis glabratus* **and** *Tropicorbis centimetralis* **to Infection**] *Publicações Avuls. Inst. Aggeu Magalhães.* Recife. Brazil. 1954, v. 3, 55–62.

The English summary appended to the paper is as follows:—

"Examination of 33,461 *T. centimetralis* collected from 1951 to 1954 in 10 different counties in the state of Pernambuco, Brasil, where Schistosomiasis has high endemic level, showed 13 snails infected with *S. mansoni* or 0·04%. In a total of 14,499 *A. glabratus*, collected in 2 areas during the years 1953–1954, 1,275 or 8·79% were infected.

"Experimental infection of *A. glabratus* and *T. centimetralis* revealed the latter to be much less susceptible (16·3%) to *S. mansoni* than *A. glabratus* (57·4%).

"Comments are made about the relationship between the susceptibility of the snails to infection by *S. mansoni* and the possibility of maintaining the human infection in the endemic areas. The qualities of the vectors are specially studied."

Barbosa, F. S., Coelho, M. V. & Dobbin, J. E., Jr. Qualidades de vetor dos hospedeiros de *S. mansoni* no nordeste do Brasil. II. Duração da infestação e eliminação de cercárias em *A. glabratus*. [**Vector Characters of Hosts of** *Schistosoma mansoni* **in North-East Brazil. II. Duration of Infection and Elimination of Cercariae in** *Australorbis glabratus*] *Publicações Avuls. Inst. Aggeu Magalhães.* Recife, Brazil. 1954, v. 3, 79–92, 3 graphs.

The English summary appended to the paper is as follows:—

"Data on shedding of cercariae and the duration of infection of the snail *Australorbis glabratus* with the trematode *S. mansoni* are presented.

"1. The emergence of the cercariae of *S. mansoni* is done according to a very marked hourly cycle. The major part of the cercariae is liberated between 11.00 A.M. and 5.00 P.M. During the rest of the day only moderate amounts of cercariae are liberated and in the first hours of the morning the liberation is practically none.

"2. Infected *Australorbis glabratus* lived an average of about 40 days and some specimens lived more than 5 months liberating cercariae every day.

"3. Infected snails liberated an average of 4598 cercariae daily during the whole period the infection lasted. Some specimens that maintained the infection for more than 4 months liberated a total of more than half million cercariae. One of the snails liberated 17.600 cercariae in one day.

"4. The infection of *Australorbis glabratus* with *S. mansoni* was

responsible in almost all the cases for the death of the snails in a period varying from 1 day to 5 months approximately.

"5. In some cases the infection ended with the spontaneous healing of the snails. This fact has been observed several times under laboratory conditions. The possibility of the snails being able to get rid of the infection by exhaustion of the reproductive capacity of the sporocysts is mentioned."

Olivier, L., Barbosa, F. S. & Coelho, M. V. **The Influence of Infection with** *Schistosoma mansoni* **on Survival of** *Australorbis glabratus*. *Publicações Avuls. Inst. Aggeu Magalhães*. Recife, Brazil. 1954, v. 3, 63–71, 1 fig. [16 refs.]

"Evidence is presented to show that *Australorbis glabratus* infected with *Schistosoma mansoni* die in much greater numbers than uninfected snails when the snails are removed from the water. A large number of deaths occurred within the first 20 to 30 days, but thereafter deaths in the 'infected' group were no more frequent than in the uninfected group.

"Snails with mature *S. mansoni* infections which survive more than 20 days out of water are known to lose their infections.

"Thus, when infected snails are removed from the water two phenomena act to eliminate the infections: first, most of the snails die within about 20 days and second, the remainder lose their infections."

Coelho, M. V. Ação das formas lavrárias de *Schistosoma mansoni* sôbre a reprodução de *Australorbis glabratus*. [**Action of** *Schistosoma mansoni* **on the Reproduction of** *Australorbis glabratus*] *Publicações Avuls. Inst. Aggeu Magalhães*. Recife, Brazil. 1954, v. 3, 39–53, 2 graphs & 3 figs. on 2 pls. [13 refs.] English summary.

Coutinho, E. M. Estudo histológico das lesões hepáticas e pulmonares verificadas antes da oviposição e nas infestações por um só sexo de *Schistosoma mansoni*. [**Histological Study of Hepatic and Pulmonary Lesions in Animals Infected with** *Schistosoma mansoni* **examined before Ovulation and in Those Infected Unisexually**] *Publicações Avuls. Inst. Aggeu Magalhães*. Recife, Brazil. 1954, v. 3, 93–121, 12 figs. on 6 pls. [33 refs.] English summary.

Coelho, B. Histopatologia da esquistossomose mansônica natural em *Rattus rattus frugivorus*. [**Histopathology of** *Schistosoma mansoni* **Lesions in Naturally Infected** *Rattus rattus frugivorus*] *Publicações Avuls. Inst. Aggeu Magalhães*. Recife, Brazil. 1954, v. 3, 5–37, 22 figs. on 11 pls. [13 refs.] English summary.

The author studied sections of organs of 21 *Rattus rattus frugivorus* naturally infected with *Schistosoma mansoni* in Brazil [this *Bulletin*,

1954, v. 51, 605] and describes the results in detail, illustrating them with 22 photomicrographs.

The lesions seen were caused by dead worms or ova, the former being found in all animals, especially in the lungs. The pseudo-tubercles found were structurally similar to those seen in man and in other animals and occurred chiefly in the liver, pancreas and mesentery, rarely in the intestine and lungs and never in other organs.

The inflammatory lesions around dead worms in the lung were sometimes extensive and the vascular system was affected, but in chronic cases the circulation could sometimes be restored. Many of the vascular lesions resembled those found in human lungs by Shaw and Ghareeb [*ibid.*, 1938, v. 35, 665]. In the liver necrotic lesions were associated with dead worms in intra-hepatic portions of the portal vein. Lesions to be explained by allergic reactions to toxins from living worms were not found.

In some cases, chronic fibrous lesions predominated in the rats, suggesting spontaneous cure.

Eggs appear to be eliminated through the mucosa, principally in the small intestine, and the mechanism differs from that of man and monkey in that the eggs remain for a time in the submucosal tissue and, as a result of histolysis, reach the glands and lumen.

Granulomata around the eggs were found in the pancreas; the kidneys rarely showed lesions but they were seen in 2 animals.

The findings of previous workers are discussed [*ibid.*, 1954, v. 51, 70, 287]. *H. J. O'D. Burke-Gaffney*

Barbosa, F. S. & Coelho, M. V. Infestação natural de *Didelphis paraguayensis paraguayensis* (Marsupialia, Didelphidae) por *Schistosoma mansoni* em Pernambuco. [**Natural Infection of the Opossum *Didelphis paraguayensis paraguayensis* with *Schistosoma mansoni* in Pernambuco**] *Publicações Avuls. Inst. Aggeu Magalhães.* Recife, Brazil. 1954, v. 3, 1–3.

The English summary appended to the paper is as follows:—

"*Didelphis paraguayensis paraguayensis* a very common opossum in that region was found naturally infected with *Schistosoma mansoni*.

"2 animals out of 10 from Paulista (Pernambuco) were found infected. Adult males and females were found in copula in the mesenteric veins and eggs were seen in the feces."

Weinbach, E. C. & Nolan, M. O. **The Effect of Pentachlorophenol on the Metabolism of the Snail** *Australorbis glabratus*. *Exper. Parasit.* New York. 1956, May, v. 5, No. 3, 276–84, 2 figs. [19 refs.]

"1. Aerobic exposure of living snails to low concentrations ($7{\cdot}5 \times 10^{-6}$ *M*, 2 ppm) of pentachlorophenol (PCP) resulted in the accumulation of acetate, lactate, pyruvate, and inorganic phosphate in their tissues.

"2. PCP, in very low concentrations (2×10^{-6} *M*) stimulated the respiration of living snails while higher concentrations (2×10^{-5} *M*) were inhibitory. Similar results were observed with minced snail tissues.

"3. These findings are discussed in relation to the hypothesis that the molluscicidal property of PCP is due, at least partially, to its ability to uncouple oxidative phosphorylation."

Magalhães Neto, B., de Moraes, J. G. & de Franca, J. T. Um método de dosagem do cobre na água tratada pelo sulfato cúprico. [**A Method of Estimation of Copper in Water Treated with Copper Sulphate**] *Publicações Avuls. Inst. Aggeu Magalhães.* Recife, Brazil. 1954, v. 3, 123–9, 2 graphs.

The English summary appended to the paper is as follows:—

"The authors described a method for the determination of copper in water with sodium diethyldithiocarbamate that can be used in the field."

Oliver, J. H., Jr. & Short, R. B. **Longevity of Miracidia of** *Schistosomatium douthitti*. *Exper. Parasit.* New York. 1956, May, v. 5, No. 3, 238–49, 2 figs. [22 refs.]

"The longevity of 1217 miracidia of *Schistosomatium douthitti* was determined in filtered Wakulla River and Spring water at room temperatures of 22·2–25·6°C. The miracidia were obtained from livers of nine C3H and albino mice.

"During the first hour after hatching 12·8% of the miracidia died; about one fourth (25·7%) had died by the end of the third hour; about one half (49·2%) by the end of the ninth hour; a few lived for 24 hours and all were dead by the twenty-fifth hour.

"It is suggested that the initial death rate, beginning within the first hour after hatching resulted from debilitation of the miracidia while they resided in host tissues. Factors weakening miracidia are probably adverse host reaction and senility."

Koizumi, K. **Studies on the Hemolytic Reaction of Antigen extracted from Adult** *Paragonimus westermani*. *Igiene Moderna.* 1956, Mar.–Apr., v. 49, Nos. 3/4, 348–52.

"(1) Using antigen prepared by hot saline extraction of macerated adult Paragonimus westermani, Middlebrook's hemolytic reaction was carried out with positive results between the sensitized red cells and infected cat's serum.

"(2) Although hemolysis did take place with respect to the capsules liberated from adult worms, the titer was less than that for the adult worms.

"(3) This reaction seems to be specific to *Paragonimus westermani*."

Smyth, J. D. **Studies on Tapeworm Physiology. VIII. Occurrence of Somatic Mitosis in *Diphyllobothrium spp.* and its Use as a Criterion for assessing Growth** *in vitro*. *Exper. Parasit.* New York. 1956, May, v. 5, No. 3, 260–70. [11 refs.]

Siurala, M. **Gastric Lesion in some Megaloblastic Anemias. Results of Follow-up Examinations.** *Acta Med. Scandinavica.* 1956, June 9, v. 154, No. 5, 337–48, 5 figs. on 3 pls.

"The principal conclusions drawn are: 1) in many PTA [pernicious tapeworm anaemia] patients the mucosal lesion seems to be caused by the tapeworm infestation, 2) histamine-fast achlorhydria in untreated PTA-patients seems at least to some extent to be caused by some kind of secretory inhibition exerted probably by the deficiency state rather than by the tapeworm itself.

"The pathogenesis of the mucosal changes and achlorhydria in addisonian pernicious anemia was discussed in brief."

[See this *Bulletin*, 1955, v. 52, 664.]

Neghme, A., Rivera, G. F. & Alvarez, M. Algunas zoonosis parasitarias en perros vagos de la ciudad de Santiago. [**Parasitic Zoonoses in Stray Dogs of Santiago City**] *Bol. Chileno de Parasit.* 1955, Oct.–Dec., v. 10, No. 4, 73–5.

The English summary appended to the paper is as follows:—

"The authors examine 1,044 stray dogs caught in the city of Santiago. Of these, 36 were caught on the grounds of the Municipal Slaughter House while 1,008 were captured in the streets of the city.

"Of the first group, 10 dogs or 27%, harbored in their intestines the tapeworm *Echinococcus granulosus*, and 26 or 72%, had in the diaphragm cysts of *Trichinella spiralis*.

"The second group showed 45 dogs, or 4·5%, infected with *Taenia echinococcus*. 75 animals of this group were examined for *T. spiralis*; of these, 3 (4%) had cysts in the diaphragm.

"In addition, data on the occurrence of other intestinal helminths are presented."

Heinz, H. J. & Brauns, W. **The Ability of Flies to transmit Ova of *Echinococcus granulosus* to Human Foods.** *South African J. Med. Sci.* 1955, Dec., v. 20, Nos. 3/4, 131–2.

The authors, from the South African Institute for Medical Research, Johannesburg, refer briefly to the literature on the role of flies in the transmission of parasitic disease. They note in particular that Schiller [this *Bulletin*, 1954, v. 51, 1078] had demonstrated transmission of hydatids by means of the blowfly, *Phormia regina*.

In the present work it was shown that 97 per cent. of fly species recovered experimentally from exposed dog faeces were *Sarcophaga tibialis* and this species was therefore used for the study.

A healthy dog was infected with a hydatid cyst obtained from a sheep and the infected faeces were exposed to the flies for 24 hours. Attempts were then made to recover ova from (a) the bodies of flies, shaken in water and the centrifuged deposit examined, (b) the contents of crushed intestinal contents of flies, and (c) fresh milk to which flies had been exposed simultaneously with exposure to infected faeces: the milk was examined by concentration methods. In (a) only 2 eggs were recovered from the sediment from the bodies of 30 flies, in (b) despite difficulties of identification in the circumstances, 22 eggs were identified with certainty from the intestines of 30 flies and in (c) 4 eggs were recovered from milk to which 70 flies had been exposed.

In infectivity tests, crushed intestines of 20 exposed flies were divided into 3 lots, 2 of which were given by mouth to rabbits and the third given on lettuce to another rabbit. All the rabbits were initially negative in the complement-fixation test for hydatid disease, but all became positive in 2 weeks: 3 months later the livers of 2 rabbits showed 6 hydatid cysts and that of the third showed 4: the cysts measured 1–3 mm. in diameter.

It seems clear that the faeces of flies may be an important source of hydatid infection. *Sarcophaga tibialis* frequents human habitations as frequently as it does dogs' faeces, so that in the unhygienic conditions of many rural villagers in South Africa, and the general tolerance of flies by the villages, the close association between man and dog may frequently result in hydatid infection through the medium of flies.

H. J. O'D. Burke-Gaffney

Bertrand, J. L., Acquaviva, R., Blavignac, F. & Thevenot, C. Compression médullaire par échinococcose arachnoïdienne. [**Compression of the Spinal Cord by a Hydatid Cyst of the Arachnoid**] *Maroc. Méd.* 1956, Apr., v. 35, No. 371, 320–24, 5 figs. [12 refs.]

di Bello, R., Horjales, J., Sanjinés, A., Badano, J. C. & Arsuaga, J. Quiste hidático del corazón operado. [**Hydatid Cyst of the Heart Successfully Operated Upon**] *Archivos Uruguayos de Med., Cirug. y Especialidades.* 1955, July–Aug.–Sept., v. 47, Nos. 1, 2 & 3, 43–55, 4 figs. English summary.

Mandoul, R. & Aroua, A. L'ankylostomose en Algérie. La région orientale de la cuvette du Hodna est bien un foyer endémique. [**Ankylostomiasis in Algeria; the Tropical Lagoon of Hodna as an Endemic Focus**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 6, 843–7.

Ankylostomiasis is usually considered to be rare in Algeria but few surveys of helminthic infection, as shown by stool examinations, have

been made of local inhabitants of the oases in Algeria. The first case in Algeria was described at Mostaganem by Ferrier [*Arch. Parasit.*, 1905, v. 10, 77] but since then there have only been occasional reports. The authors examined the stools from 106 of the inhabitants of M'Doukal. The stools were preserved by the addition of 5 per cent. formol and transported to Algiers; 48 were found to contain hookworm ova. The age distribution was as follows:—under 5 years, 3 positive out of 28; 5–15 years, 23 positive out of 38; adults, 22 positive out of 40. The total population of M'Doukal is between 2,500 and 3,000, nearly all agriculturalists. The warmth, shade, humidity and lack of hygiene create suitable conditions for the sustaining of a focus of ankylostomiasis. The lack of hygiene also leads to numerous other intestinal infections with protozoa, *Ascaris* and other helminths. It is probable that the similar conditions in other oases are also associated with ankylostomiasis although comparable investigations have not yet been carried out and the resultant anaemia may be incorrectly attributed to malaria. *Frederick J. Wright*

Hobo, B. [**Epidemiological Studies on** *Ascaris* **Infection among Prisoners and the Length of Life of** *Ascaris lumbricoides* **in Human Host**] *Japanese J. Nation's Health.* 1956, Mar., v. 25, No. 1, 1–14, 2 figs. [15 refs.] [In Japanese.] English summary.

The author studied the incidence of *Ascaris* infection in the prison at Kyoto City, Japan, for 4 years, and observed that it fell from 56·6 per cent. in January 1952 to 17·0 per cent. in May 1955: this corresponded to a downward trend in the infection in the general population.

The incidence of *Ascaris* decreased steadily with the period of confinement of the prisoners, because of less opportunity for new infection among them. This is attributed chiefly to their limited supply of raw vegetables and fruits; but there is evidently some other source of infection, because the incidence was significantly higher in prisoners on outdoor work than in those who worked indoors.

Nine of 58 persons who were examined for reinfection for at least a year after chemotherapy were found to have become reinfected, but they became negative spontaneously in 9 to 20 months (mean 14·6). It is estimated that *Ascaris* may survive in the human host for 10 to 24 months, with a mean of 17 ± 3 months. *H. J. O'D. Burke-Gaffney*

Wolf, J. **Patent Omphalo-Mesenteric Duct Associated with** *Ascaris lumbricoides* **Infestation.** *J. Trop. Med. & Hyg.* 1956, June, v. 59, No. 6, 134–7, 6 figs. [10 refs.]

" (i) A case is described of a persistent omphalo-mesenteric (vitelline) duct with Meckel's diverticulum, in a Malay girl, aged 3, infected with

Ascaris lumbricoides, resulting in the unusual intermittent passage of round-worms through the umbilicus, together with muco-purulent and some faecal matter.

" (ii) The patency of the duct did not manifest itself until the second year of life.

" (iii) The intra-intestinal use of Iodoxyl ('Uropac'), instead of Barium, to visualise omphalo-mesenteric pathology before operation, is recommended.

" (iv) Histo-pathological examination of the sub-umbilical segment of the duct demonstrated a foreign-body giant-cell reaction to ascaris eggs, fixed in the tissues.

" (v) The late escape of ascaris from the umbilicus during the third year is regarded as a safety-valve phenomenon, secondary to the development of adhesions, with kinking and narrowing of a loop of terminal ileum, fixed to a granulomatous segment of the duct. The case serves to illustrate the liability of all cases of persistent vitelline duct to intestinal obstruction.

" (vi) Treatment consisted of radical excision of the entire tract, together with the umbilicus."

Elbers, S. P. Über die Bekämpfung der Wurmplage in Indonesien. [**The Control of Helminth Infections in Indonesia**] *Med. Klin.* 1956, June 22, v. 51, No. 25, 1074–5.

The severe helminth infection of the inhabitants of Indonesia is a medical problem of great importance and there is scarcely any anthelmintic drug which can be given without risk to those patients who are undernourished and very anaemic. This paper gives an enthusiastic account of experience of treatment with the preparation called Vermella (C. F. Asche & Co. AG., Hamburg-Altona) which is a halogen oxy-derivative of 1-methyl-4-isopropylbenzol. It is much less toxic than hexylresorcinol, has no local irritant effect and has a low solubility in water and hence is but little resorbed into the system. The preparation is in the form of dragées and capsules, the latter being perhaps the better for infections in the upper intestine since it is assumed that they disintegrate just before the duodenum is reached. Experimental treatment was restricted to individuals who were harbouring *Ascaris* or *Ancylostoma* or both and the number of these was 100 in Java and more than 100 in Borneo. Equally good results of nearly 100 per cent. cure were obtained in both groups in spite of the fact that in Java but not in Borneo all the patients were also given papaw fruit daily as a source of vitamin A and this fruit might have had some enzymatic effect on the worms because of its papain content. The numerical details of the effects of the treatment of these patients, all of whom were between 13 and 65

years of age, are described. It is mentioned that the additional enterobiasis which existed in all these patients appears also to have been cured in all cases although this was not confirmed by anal swabbing.

The method of treatment was to administer 3 dragées or 3 capsules before breakfast and then to give the same dose of Vermella on 5 occasions at intervals of 2 hours. On the second day of the cure 3 dragées or capsules were given just before and again 2 hours after breakfast, followed in the early afternoon by vigorous purgation by castor oil. If the first course of treatment was not successful, a second course was given 4 or 5 days later and this consisted of 4 dragées or capsules 5 times on the first day and twice on the second day. The drug was well tolerated and no unpleasant side-effects were observed.

M. E. Delafield

Fiji: Medical Department. **Filariasis in Fiji 1944–1955** [Nelson, S. & Cruikshank, J. M.]. 50 mimeographed pp., 1 folding map, 8 pls. & 2 graphs (1 folding). [1956.]

This report starts with a general account of the history, geography and climate of Fiji in relation to filariasis, and then details the stages by which progress was made in knowledge of the disease and its vector. The entomology has been elucidated with some difficulty. *Aëdes scutellaris pseudoscutellaris* Theobald, the main vector, has been divided recently into two species (the new species being called *Aëdes polynesiensis*). Exhaustive investigations into breeding habits have been made with a view to species eradication. The latter measure is not very popular as it demands hard work from local populations, and by leaving many other biting species alive gives no apparent benefit from their labours. Recently, also, two other mosquitoes, *Culex fatigans* and *Aëdes fijiensis*, have been incriminated as vectors.

Insecticides, so far, have played little part in the anti-vector campaign, particularly as *Aëdes pseudoscutellaris* does not rest in houses. The introduction of *Megarhinus* spp., the larvae of which prey on those of *A. pseudoscutellaris*, has been of doubtful value.

The methods of filariasis survey are given in detail. A first essential is the examination of the entire population. It has been found that the examination of 1 cc. venous blood gives 26 per cent. more positives than that of 20 cmm. of finger blood. The Knott technique, 1 cc. of blood allowed to sediment in 9 cc. of 2 per cent. formalin, is used for examination of the larger volume.

Four different experiments with diethylcarbamazine therapy have been followed up for a year or more:

(i) 112 positives treated with 2 mgm. per kgm. body weight daily (usually 50 mgm. t.d.s.) for 7 days;

(ii) 158 positives treated with 50 mgm. on 1 day each month for 12 months;

(iii) 204 positives treated with 50 mgm. t.d.s. for 3 days. Results:—

		Before treatment	*After six months*	*After 12 months*
Average mf./cc. blood	(i)	39·8	2·8	4·2
	(ii)	13·55	0·32	0·38
	(iii)	23·39	—	11·14

(iv) Almost the entire population of Lakeba Island over 1 year of age, whether positive or not, were given 50 mgm. on one day each month for 12 months. The average number of microfilariae in their blood was reduced, microfilariae disappeared in 60–70 per cent., and attacks of filarial fever were reduced in number and intensity. Reactions, which never lasted more than 3 days, occurred in 80 per cent. of those treated. It is concluded that the administration of 50 mgm. on one day each month is the most helpful method of employing diethylcarbamazine.

B. B. Waddy

See also p. 1278, Ovazza; Hamon; Neri; Grenier, Contribution à l'étude des diptères vulnérants de l'Empire d'Éthiopie. I. Culicidae. II. Simuliidae. Simulies et onchocercose. III. Tabanidae. IV. Glossinae. [**A Study of the Biting Flies of Ethiopia: Culicidae, Simuliidae (and Onchocerciasis), Tabanidae, Glossinae**]

McFadzean, J. A. & Smiles, J. **Studies of *Litomosoides carinii* by Phase-Contrast Microscopy: the Development of the Larvae.** *J. Helminthology.* 1956, v. 30, No. 1, 25–32, 23 figs. on 3 pls. [12 refs.]

The authors observed by phase-contrast microscopy the stages of development of the larvae of *Litomosoides carinii* from a single cell, and consider these to be similar in outline to those of *Loa loa* as described by Dr. R. Penel in 1904 (*Les Filaires du Sang de L'Homme*, 2nd Ed. 1905. Paris).

The authors pay particular attention to the controversial question of the origin of the sheath in microfilariae, and briefly discuss the works of previous writers. Their own observations are summarized as follows:—

"Throughout its development the larva was enclosed within a membrane which was later stretched by the movement of the larva to form the sheath of the microfilaria. All the microfilariae from the adult female worms, from the pleural fluid, and from the peripheral blood of the large number of infected cotton rats, examined, were seen by phase-contrast microscopy to have sheaths."

R. M. Gordon

YEAGER, W. **Clinical Evaluation of a New Compound for the Treatment of Pinworm Infestation: Preliminary Report.** *Southern Med. J.* 1956, May, v. 49, No. 5, 539–40.

The author reports the results of treating 59 children between the ages of 2 and 8 years, in whom the mothers had reported the presence of adult worms [presumably *Enterobius vermicularis*] about the anus, with a new compound (m-allyloxyphenylcarbamylmethyl) dipropyl (p-chlorobenzyl) ammonium chloride monohydrate (RO 2-5655/3 of Hoffmann-La Roche Inc.). Test of cure was the absence of ova in the Cellophane tape test weekly for 8 weeks.

A group of 18 patients were treated with a dosage of 30 mgm. per kgm. per day for 3 days; 5 of these were not cured.

A second group of 29 were treated with 40 mgm. per kgm. per day for 3 days; 4 of these were not cured; 3 patients complained of "mild stomach cramps" on the 2nd day but completed the treatment.

A third group of 12 were treated with 50 mgm. per kgm. per day; 5 were unable to complete the proposed course of 3 days because of more severe cramps and mild diarrhoea; the remaining 7 were cured.

The author considers the optimum tolerated dosage to be between 40 mgm. and 50 mgm. per kgm. for 3 days, that at 40 mgm. per kgm. approximately 90 per cent. will be cured and that 10 per cent. will complain of stomach cramps which cease when the drug is stopped.

[The series is small, the drug perhaps slightly more effective than piperazine citrate and piperazine adipate, although more disturbing. See this *Bulletin*, 1956, v. 53, 93.] *Frederick J. Wright*

SADUN, E. H., MELVIN, Dorothy M., BROOKE, M. M. & CARTER, C. H. **A New Quantitative Approach to the Study of Anthelminthic Drugs, with an Evaluation of Piperazine Hexahydrate, Phthalylsulfathiazole, and RO 2–5655/3 in the Treatment of Enterobius Infection.** *J. Pediatrics.* St. Louis. 1956, June, v. 48, No. 6, 754–62, 2 figs. [12 refs.]

The authors report a carefully conducted and controlled experiment carried out in a mental hospital. All the patients in each block, except for the 2 control blocks, were treated to minimize re-infections. Of the 265 patients, 200 were found to be infected with *Enterobius vermicularis*. The table on p. 1260 records the results.

RO 2-5655/3 [see above] in the larger doses produced toxic symptoms.

A coefficient of infection (CI) was obtained from the frequency with which cellulose tape specimens, obtained on 6 successive nights, were positive. The effect on this coefficient confirmed the efficacy of piperazine hexahydrate and phthalylsulphathiazole, in the larger doses, but also proved to be a more sensitive indicator for the action schedules which were less effective. Re-examination after an interval of 67 days

Group Number	Persons in Group	Number Infected	Prevalence per cent.	Drug	Dosage per day	Duration of Therapy in Days	Results of Treatment among Infected Individuals	
							Number who became Negative	Per cent. who became Negative
I	39	20	51	Piperazine hexahydrate	2 gm.	7	13	65
II	36	24	67	Piperazine hexahydrate	Under 20 kgm., 2 gm. 20 to 29 kgm., 3 gm. 30 to 39 kgm., 4 gm. 40 kgm. and over, 5 gm.	14	24	100
III	25	24	96	Phthalylsulphathiazole	8 gm.	7	1	4
IV	33	25	76	Phthalylsulphathiazole	Under 20 kgm., 12 gm. 20 kgm. and over, 16 gm.	14	24	96
V	39	38	97	RO 2-5655/3	2 gm.	7	14	37
VI	33	27	82	RO 2-5655/3	Under 20 kgm., 1·0 gm. 20 to 29 kgm., 1·5 gm. 30 kgm. and over, 2·0 gm.	14	13	48
VII	60	42	70	None	—	—	9	21

showed that only a few individuals in each group had become positive and these were considered to be re-infections. [The spelling of the chemical name of RO 2-5655/3 given in the paper is distorted.]

Frederick J. Wright

DEFICIENCY DISEASES

Luyken, R. & Luyken-Koning, F. W. M. **Nutritional State of the Marind-Anim Tribe in South New Guinea.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Dec., v. 7, No. 4, 315–39, 5 figs. & 1 map. [Numerous refs.]

Clinical examinations and anthropometric measurements were made on over 700 children, and dietary surveys (lasting one day only) on nearly 700 families. The calorie intakes were usually satisfactory but intakes of protein and vitamins were often far below acceptable standards of requirements. Evidence of the major deficiency diseases was not found, but many of the children had minor clinical signs suggestive of a diet qualitatively inadequate. Out of all the children 29 per cent. had enlarged livers and 23 per cent. enlarged spleens. The authors are not prepared to speculate as to whether a deficiency of protein or malarial infection was the more important factor in causing the enlargement of the liver.

R. Passmore

Luyken, R. & Luyken-Koning, F. W. M. **Nutrition and Nutritional Status of Urban and Rural Papuans in Netherlands New-Guinea.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1956, Mar., v. 8, No. 1, 45–54, 3 figs.

This paper records a survey on the same lines as the authors' previous investigation [see above]. The diets of about 200 urban and 100 rural families were investigated and about 100 schoolchildren were clinically examined. The general picture in the surveys is similar. Of the children examined 28 per cent. had an enlarged liver and 46 per cent. an enlarged spleen. The calorie content of the urban diets was low. However, the urban diet was of high vitamin A activity, mostly derived from vegetables gathered in swamps that surround the town of Hollandia. Urban diets also contained more proteins as milk, meat and fish were more often available.

[These very thorough surveys indicate that the dietary conditions in Dutch New Guinea are far from satisfactory. Although frank deficiency diseases do not appear to be common, the general level of health of most

of the children is unsatisfactory. The information collected should be a valuable basis on which to build up a nutrition programme for the country.] *R. Passmore*

Pretorius, P. J., Davel, J. G. A. & Coetzee, J. N. **Some Observations on the Development of Kwashiorkor. A Study of 205 Cases.** *South African Med. J.* 1956, Apr. 28, v. 30, No. 17, 396–9. [24 refs.]

The authors describe 205 cases of kwashiorkor seen in Pretoria. They have been especially interested in aetiology. Inadequate diets were responsible in all cases. Among background factors, parental absence was most important. Only 79 of the children were supported by their fathers. Neither mother nor father was responsible for 43 of the children, who for the most part were looked after by grandparents. Intestinal parasitic infections and malaria do not play a significant role in the causation of the disease in Pretoria. Bacterial infections, however, were common; these included tuberculosis (4), syphilis (3), shigella (10) and salmonella (3), infections of the bowel, urinary infections (54) and ear, nose and throat infections (the majority). It is suggested that these infections by creating greater demands for nutrients, especially proteins, are important in the aetiology of kwashiorkor. *R. Passmore*

Kinnear, A. A. & Pretorius, P. J. **Liver Function in Kwashiorkor.** *Brit. Med. J.* 1956, June 30, 1528–30. [41 refs.]

Liver function tests were carried out on 107 patients with kwashiorkor in Pretoria. The most characteristic finding was a low level of serum albumin (mean value 1·55 gm. per 100 ml., range 0·91–2·44). The thymol test showed nothing of significance. Serum colloid gold was no assistance in either diagnosis or prognosis. The van den Bergh reaction and serum bilirubin were normal in all cases. The bromsulphthalein test was useful in prognosis. Abnormal retention at 6 days after treatment had begun was followed by death in 19 patients. *R. Passmore*

Went, L. N. & Gandasoebrata, R. R. **Some Investigations into the Blood Chemistry of Kwashiorkor.** *Documenta Med. Geograph. et Trop.* Amsterdam. 1955, Dec., v. 7, No. 4, 363–70, 2 figs. [18 refs.]

The mean protein content of the serum in 16 cases of kwashiorkor was 4·0 gm. per cent. The mean albumin/globulin ratio was 0·6. Serum sodium was always normal (135–140 m eq. per litre) but the serum potassium level was often low and ranged from 2·5 to 5·0 m eq. per litre.

There appeared to be no relationship between the severity of the disease and the serum potassium. Blood urea levels were usually low. The meaning and implication of these findings are briefly discussed.

R. Passmore

Menguy, Yvonne. La maladie oedémateuse du sevrage. Carence protidique du nourrisson marocain musulman. [**Oedema of Weaning. Protein Deficiency in the Moroccan Musulman Infant**] *Maroc Méd.* 1956, Mar., v. 35, No. 370, 183–207, 5 charts, 2 text figs. & 4 coloured figs. on 2 pls.

This is the text of a prize thesis. It is based on a personal experience of 57 patients seen in a dispensary in 1948 and 80 seen in a hospital in Casablanca in 1949–53. An excellent account is given of the clinical features, biochemical findings and morbid anatomy. The disease is much commoner in the towns than in the country. Weaning takes place abruptly and thereafter the child feeds with the family and is given bread, over-sweetened tea, a little semolina, rice and sweet potatoes; but no meat or eggs before 2½ years and practically no fresh legumes or fruit and no milk (except among the Berbers, where the disease is not seen).

In treatment, the value of human plasma is stressed. It was given intraperitoneally in a dose of 150 cc. twice a week. The plasma was diluted to a concentration of 35 gm. of protein per litre. No untoward reactions have been observed.

The author makes it clear that the disease, as observed by her in Morocco, does not differ in any significant manner from kwashiorkor as described in other parts of Africa. *R. Passmore*

Vincent, G. Hypoprotéinémie nutritionnelle infantile à La Réunion: le Kwashiorkor. [**Infantile Nutritional Hypoproteinaemia in Réunion: Kwashiorkor**] *Méd. Trop.* Marseilles. 1956, Mar.–Apr., v. 16, No. 2, 241–51, 4 figs. on pl.

This is an excellent clinical description of a disorder, prevalent on the island of Réunion, which in all essential features is the same as African kwashiorkor. In Réunion whites and children of mixed race are affected more often than pure Negroes. As a result, the dermatosis is associated with a hyperpigmentation of the skin and the discoloration of the hair is less visible. Values of serum globulins are normal, in contrast to the hyperglobulinaemia in Africa. An infectious episode seems to be always the factor, which upsets a precarious protein equilibrium.

The author stresses the importance of education. Mothers must be taught that children are not necessarily properly nourished because their appetite appears satisfied. *R. Passmore*

Food and Agriculture Organization of the United Nations. **FAO Nutritional Studies No. 14. Protein Malnutrition in Brazil** [Waterlow, J. & Vergara, A.]. pp. vi + 40. [58 refs.] Rome: 1956, Mar. [Sales Agent in U.K., H.M. Stationery Office.] [$0.50; 2s. 6d.]

The condition known as *distrofia pluricarencial* is fairly common in the cities of Brazil and is basically the same as the disease better known as kwashiorkor. The authors, however, prefer the more specific term, protein malnutrition. This report provides a good general account of the disease with special emphasis on the natural history and prevention. Those familiar with the disease in Africa and Asia will learn little new here, but the report should be most useful in stimulating preventive measures in Brazil. *R. Passmore*

Kahn, E. **A Neurological Syndrome in Children recovering from Malnutrition.** *South African Med. J.* 1956, Apr. 7, v. 30, No. 14, 345.

The following syndrome has been observed in about one out of 300 severe cases of malnutrition in children observed in Johannesburg. There are coarse tremors, affecting most frequently the arms, but sometimes the legs, and the muscles of the face, tongue and abdomen. Cog-wheel rigidity may be present. The tendon reflexes are nearly always exaggerated. A few cases show myoclonic jerks. Postural abnormalities are common in the upper extremities. The arms are abducted at the shoulders and flexed at the elbows. The hands are held in ulnar deviations, the fingers are flexed at the metacarpophalangeal joints and extended at the interphalangeal joints and the thumb is flexed into the palm.

Recovery is complete in almost all cases and does not appear to be facilitated by any specific nutritional therapy. The precise aetiology is also unknown.

[This is an interesting account of an apparently new syndrome. It is very short and the author gives no clinical details of the nutritional conditions which appear to predispose to the disorder.] *R. Passmore*

SPRUE

Gardner, F. H. **Observations on the Cytology of Gastric Epithelium in Tropical Sprue.** *J. Lab. & Clin. Med.* 1956, Apr., v. 47, No. 4, 529–39, 4 figs. [12 refs.]

In view of the similarities that exist between the haematological picture in pernicious anaemia and in tropical sprue, the author has compared the

epithelium of the tongue and stomach in patients suffering from tropical sprue.

The criteria for the diagnosis of tropical sprue accepted were those outlined by Rodriguez-Molina [this *Bulletin*, 1942, v. 39, 638]. These included stomato-glossitis, gastro-intestinal disturbances, a history of recent weight loss, the presence of a macrocytic hyperchromic anaemia, a flat glucose tolerance curve, hyperpigmentation of the skin, inflammation and atrophy of the gastric and recto-sigmoid mucosa and the presence of acid in the stomach in a high proportion of cases. Evidence of impaired fat absorption from the intestine was apparently not insisted upon as a diagnostic criterion. [The criteria of diagnosis therefore are not those generally employed in Europe and Asia and it is doubtful whether the cases reported in this paper can be compared with tropical sprue originating from regions other than the Caribbean. The cases may well be examples of nutritional megaloblastic anaemia.] Some of the 19 patients who had sprue and who were studied were malnourished, as is indicated by the statement that " In some instances the improved nutrition of a hospital diet initiated a clinical response. . . ."

No consistent abnormalities could be detected in epithelium obtained by scraping the tip or border of the tongue. From the gastric mucosa of each of the 19 patients diagnosed as suffering from sprue, however, abnormal squamous epithelial cells were recovered. The nuclei of the cells had an open network of the chromatin material such as is not found in normal cells. There was a marked increase in the numbers of multinucleated cells and some cells had an irregular serrated outline of the nucleus indicating partial or abnormal division. In other instances a pale area around the nucleus was found. Changes were also present in the columnar cells of the stomach; these cells were both longer and broader than normal, their cytoplasm stained more deeply and was more granular than normal. Some cells had within them inclusions which possibly represented abnormalities of nuclear material. Changes in cells similar to those here reported have also been found in patients suffering from pernicious anaemia.

In the cases studied free acid was present in the gastric juice and there was no evidence of defective intrinsic-factor function.

Sixteen patients were studied after they had received 5 mgm. of folic acid orally each day, or 30 μgm. of vitamin B12 intramuscularly each week, for periods varying from 12 days to 5 years. The cytological changes did not disappear rapidly and in this respect contrasted with the megaloblastic changes originally present in the bone-marrow.

A. W. Woodruff

HAEMATOLOGY

Walt, F., Holman, S. & Hendrickse, R. G. **Megaloblastic Anaemia of Infancy in Kwashiorkor and other Diseases.** *Brit. Med. J.* 1956, May 26, 1199–1203. [13 refs.]

From among 776 patients admitted to the paediatric wards of the McCord Zulu Hospital, Durban, between February 17 1954 and February 7 1955, bone-marrow was aspirated whenever the haemoglobin was found to be less than 6·7 gm./100 ml. The total number examined in this way is not stated but a megaloblastic marrow was found in 42 patients and among these 22 also had typical kwashiorkor. Parasitic infections, such as with hookworms, were infrequent and malaria a great rarity. The response of the anaemia and of the marrow to treatment with folic acid was good.

The authors speculate on the reasons why megaloblastic anaemia in infancy in Durban should now be found, for in a similar study carried out by Walt *et al.* in 1950 [this *Bulletin*, 1951, v. 48, 394] 36 cases of kwashiorkor were examined and megaloblastic change was not found in the marrow of any. It is possible, they say, that the number of such cases is increasing in Durban.

Megaloblastic change in the marrow of these patients can apparently be influenced by complex factors, for to 2 with kwashiorkor and megaloblastic change no folic acid was given yet both had recovered and had normal bone-marrow on discharge from hospital. Regarding others, however, administration of 5 mgm. folic acid daily while the patient was in hospital suffering from kwashiorkor did not prevent the development of megaloblastic change in the bone-marrow—possibly as a result of diminished absorption from the bowel. *A. W. Woodruff*

I. Foy, H. & Kondi, Athena. **Nutritional and Intestinal Factors and Iron Losses in the Genesis of Tropical Anaemias.** *Lancet.* 1956, Apr. 14, 423–4. [27 refs.]

II. Trowell, H. C.; Roche, M. **Genesis of Tropical Anaemias.** [Correspondence.] *Ibid.*, June 16, 964–5. [18 refs.]

III. Foy, H. & Kondi, Athena; Berry, C. G. **Genesis of Tropical Anaemias.** [Correspondence.] *Ibid.*, July 14, 95–7.

I. Foy and Kondi state that the iron deficiency anaemia in tropical areas is largely due to an inadequate replacement of iron losses. Loss of iron due to bleeding caused by hookworms is less important than loss of body iron in sweat, urine, etc. The authors estimate that the total iron loss by these means amounts to 1–1·5 mgm. per day. Although the iron content of the diet may seem adequate, faulty absorption (high phytate content of food, gastric achlorhydria, etc.) invalidates the apparent

adequacy of iron intake. Even when the iron content of the diet is sufficient by ordinary standards, an addition of 20–25 grains of ferrous salt will cure the anaemia.

II. Trowell points out that in the course of their discussion of iron deficiency anaemia in the tropics Foy and Kondi seem to have altered their original scheme of tropical anaemias [Foy, Kondi and Hargreaves, this *Bulletin*, 1952, v. 49, 1146]. By their altering some of their original conceptions and by changes Trowell himself has introduced into his own approach to that subject, apparent differences of opinion may become more reconciled.

Roche does not agree with Foy and Kondi in allotting to the hookworms only a minor role in the causation of iron deficiency anaemia. He "marked" with isotopes the red blood cells of 22 subjects with hookworm infection and studied the radio-activity in the faeces and in the blood. Though loss of blood is not the only factor involved and the iron content of the diet has its part to play, it is not possible to dismiss as unimportant losses of blood which may go up to 100 or 200 ml. per day.

III. Foy and Kondi in answering Trowell consider that their original classification of anaemias into four groups still holds, and that the iron deficiency anaemias and megaloblastic anaemias—both subdivided into two types—are the two most important ones. They still differ from Trowell by not accepting protein deficiency as anything more than a subsidiary cause of anaemia. While agreeing with Roche that a daily blood loss of 100–200 ml. would be very serious they state that in their own cases of hookworm anaemia such great losses did not occur.

Berry refers to experiences in Nigeria where an iron deficiency anaemia could on treatment with iron change into one of megaloblastic type. He suggests that the initial rapid response to iron must have exhausted the low reserves of liver haemopoietic principle. *H. Lehmann*

Allison, A. C. **Sickle-Cell Anaemia and Haemoglobin C.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 185–96. [Numerous refs.] Discussion 197–203, 1 fig. [Edington, G. M.; Woodruff, A. W.; Roberts, J. A. F.; Shute, P. G.; Chesterman, C. C.; Shooter, E. M. & Skinner, E. R.; Allison, A. C. (in reply)].

Although the interest in abnormal haemoglobins has been considerable and a number of papers on the subject have appeared in the *Trans. Roy. Soc. Trop. Med. & Hyg.* from time to time, this is the first paper specifically devoted to the subject which has been read to the Society. Being itself largely a summary of what is known at present about sickle-cell anaemia and haemoglobin C it cannot satisfactorily be summarized in detail, but there are also aspects of Allison's work which are new and which are recorded by him for the first time on this occasion.

The author reports from a paper to be published (*Clin. Sci.*, 1956, in

press) that he has obtained evidence that in the absence of oxygen sickle-cell haemoglobin molecules combine with one another to form helices. The long rod-like helices attract one another in a parallel orientation resulting in an elongated birefringent mass of haemoglobin which gives the sickle-cell its characteristic shape. The higher the proportion of sickle-cell haemoglobin in a red cell the more pronounced is this process. Other haemoglobins, if present, may replace some molecules of sickle-cell haemoglobin in the helices. Haemoglobin C is more efficient in that respect than normal adult haemoglobin (A), and foetal haemoglobin (F) will not form mixed aggregates at all; thus the presence of haemoglobin C will interfere less with the sickling process than that of haemoglobin A, and a high percentage of haemoglobin F will actually inhibit sickling. The cells of sickle-cell homozygotes will assume the sickle shape at oxygen tension of 30 mm. Hg., whereas those of sickle-cell trait carriers will only do so at oxygen tensions below 15 mm. As expected from the efficiency of formation of mixed haemoglobin aggregates, cells from sickle-cell—haemoglobin-C heterozygotes will be sickled at tensions very slightly below those of sickle-cell homozygotes. Although the oxygen tension of venous blood may often fall to 15 mm. or less, with severe vasoconstriction, venous blood from subjects with sickle-cell anaemia will show only a small percentage of sickle cells. This fact is explained by the author on the basis of the time required for the sickling transformation to take place (*Biochem. J.*, 1956, in press). The physico-chemical changes involved in sickling take at least two minutes to reach completion, but blood remains in the venous side of the circulation only for less than 15 seconds. Thus intravascular sickling does not occur in sickle-cell anaemia unless there is stasis of blood, and it is not without relevance that sickling occurs particularly in the spleen where stasis is often prolonged.

Though some sickle-cell homozygotes survive to become adults under African conditions, the viability of this genotype to reproductive age is assessed to be only about 20 per cent. of that of other genotypes. Sickle-cell trait carriers may possibly develop otherwise unexplained renal bleeding, but it can be taken as established that they are not anaemic and do not have leg ulcers. There is a lucid review of the factors which allow the maintenance of the sickle-cell gene at high frequency in some African populations. The advantage of sickle-cell heterozygotes over normal homozygotes in surviving malaria balances the disadvantage the sickling gene confers on sickle-cell homogygotes. The author reports on his new finding in the Musoma district of Tanganyika (*Ann. Eugen.*, Lond., 1956, in press). Sickle-cell heterozygotes were more frequent in the parental population than in the infant population. [The abstracter looks forward to the publication of the data on which this statement is based. Other workers investigating very large samples of African populations have not been so fortunate as Allison, and could not obtain significant differences.] The observed increase in frequency of heterozygotes is close to that expected if the heterozygote had a 25 per cent. advantage over both normal

and sickle-cell homozygotes. In order to achieve this selection the mortality for malaria must be about 10 per cent. in the whole population or 15 per cent. in the non-sicklers.

In West Africa both haemoglobin S and C are found, and Allison reports (*ibid.*, in press) that haemoglobin C was absent from the East Africans he tested but was present at a high frequency in the Gold Coast. There it was found more often in the north than in the south and fell in incidence in the British territories on either side of the Gold Coast. He concludes that in contrast to the widespread distribution of the sickle-cell gene there is a single focus of haemoglobin C in Africa. The viability of sickle-cell homozygotes, sickle-cell—haemoglobin-C heterozygotes and haemoglobin-C homozygotes between birth and reproductive age is assessed to be about 19 per cent., 41 per cent. and 55 per cent., respectively, of the average viability of all geno-types. Like the sickle-cell trait carriers, the haemoglobin C trait carriers must therefore be at an advantage compared with the homozygotes. Otherwise the disadvantage of the sickle-cell—haemoglobin-C heterozygotes and haemoglobin-C homozygotes would cause the gradual disappearance of the haemoglobin C gene.

The author thinks little of the anthropological conclusions drawn from the distribution of sickle-cell haemoglobin and of haemoglobin C: " When Lehmann and Cutbush (1952) found high frequencies of the sickle-cell trait in some aboriginals of South India, this was taken as proof of the Indian origin of East Africans. It is in fact nothing of the kind." [To put it this way is a little unkind to Lehmann and Cutbush, because a reader not familiar with the subject will assume that they were responsible both for the original finding and the conclusion. It makes short shrift of the less nonsensical but much more relevant conclusions which anthropologists have drawn when they related this finding to others in Arabia and to the distribution of blood groups.]

Edington summarized work carried out by him and Colbourne and Lehmann which has since been published [this *Bulletin*, 1956, v. 53, 845; *ibid.*, 1045]. Woodruff described a case of sickle-cell anaemia seen in England and expressed the hope that our knowledge of the molecular arrangements underlying sickling might one day lead us to a method which prevents erythrocytes from assuming the sickle shape in those who suffer from the disease. Fraser Roberts pointed out that genetic work on haemoglobins may be a model for work on other characters more frequent in temperate climates. Shute reported that the placenta, being a newly created tissue, was a rich culture medium for malaria parasites even in semi-immune females and wondered whether this might have a bearing on the difficulties which women with sickle-cell anaemia face when they become pregnant. Chesterman reminded the meeting of the influence of a milk diet on the development of malaria in infants and wondered whether an enquiry had been made as to the lactational habits in populations in whom sickle-cell anaemia was found. This might help to assess the relative advantage of being "either a suckling sickler or a sickly suckling."

Shooter and Skinner showed diagrams of open boundary electrophoresis of normal and abnormal haemoglobins and demonstrated an example of the small amount of haemoglobin E present in all normal blood which has been recently demonstrated by Kunkel and Wallenius [*ibid.*, 488]. Allison in his reply pointed out that considerations similar to those he had been putting forward for haemoglobin S and C might apply to the distribution of the thalassaemia gene and to that of haemoglobin E.

H. Lehmann

Bousser, J., Christol, D., Dantchev, D., Marolleau & Huet de Barochez, Y. Deux cas d'hémoglobinose C. [**Two Cases of Haemoglobin C Disease**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1956, Nos. 14/15, 411–19, 1 fig. [21 refs.]

A full account and discussion of 2 cases in Algerians, seen in Paris.

Worms, R., Albahary, C., Alagille, D. & Philbert, M. Hémoglobinose C homozygote. [**Homozygous Haemoglobin C Disease**] *Bull. et Mém. Soc. Méd. Hôpit. de Paris.* 1956, Nos. 14/15, 401–11, 2 figs. [30 refs.]

A review of the literature and discussion of a case seen in Paris in an Algerian woman and the presence of haemoglobin C in her father and 3 children.

Shields, G. S., Wethers, Doris, Gavis, G. & Watson, R. Janet. **Hemoglobin-S-Thalassemia Disease. Report of a Case in a Negro Child.** *J. Dis. Children.* 1956, May, v. 91, No. 5, 485–9, 1 chart. [23 refs.]

" S-thalassemia disease was found in a 7-year-old Negro boy. The only clinical manifestations were two attacks of abdominal pain and a mild anemia. The hematologic findings of special diagnostic significance were the following:

" (1) An electrophoretic pattern showing 90% hemoglobin S, 6% hemoglobin A, and 4% hemoglobin F.

" (2) The virtual absence of irreversible sickle cells in the blood smear, although the sickle-cell preparation showed 100% sickling.

" (3) Marked microcytosis, hypochromia, and poikilocytosis of the red blood cells, with many targets, associated with normal plasma iron.

" (4) The presence of thalassemia minor in the Negro mother."

VENOMS AND ANTIVENENES

Reid, H. A. **Sea-Snake Bites.** *Brit. Med. J.* 1956, July 14, 73–8, 4 figs. [30 refs.]

An account is given of observations on sea-snake bites in Malayan waters. It is noted that, although poisonous sea-snakes teem in Eastern waters from the Persian Gulf to Japan and the shores of Northern Australia, records of bites, and deaths from them, are few. This may partly be due to the circumstances in which they occur, few cases being likely to come to hospital, but it appears that no case occurred among the very large number of American troops who served in the Pacific during the recent war. It is unlikely that cases could have escaped notice. While there is a general impression that bites are rare the author's own enquiries show that they are by no means uncommon in Malayan waters. He has collected details in fishing villages which show considerable numbers among fishermen and bathers, with a mortality possibly up to about 20 per cent.

There are a number of poisonous species of sea-snakes (Hydrophiidae), the commonest probably being *Enhydrina schistosa*. Its yield of venom has been estimated to average 9·4 mgm. and the fatal dose for a man of 70 kgm. is put at 3·5 mgm. The venom of another species, *Laticauda colubrina*, has been found to be twice as toxic as cobra venom. The venoms of the true sea-snakes are purely neurotoxic, differing in this respect from those of vipers and colubrine snakes which also possess haemotoxic fractions. The symptoms produced are due to motor and bulbar paralysis. The bite itself is painless but after a varying period, according to the dose of venom injected, the onset of symptoms is shown by aching and stiffness of the muscles with pain on movement. Bulbar paralysis follows, or accompanies, the peripheral paresis; trismus and ptosis are characteristic signs. In severe cases respiratory paralysis develops, partly owing to the action of the venom on the respiratory centre and partly to the peripheral paralysis of the muscles of respiration. If recovery takes place it is complete without any after effect.

The diagnosis of sea-snake bite is not always easy as the victim may not be aware of the fact that a prick which he experienced while in the water was due to this cause. The following criteria for diagnosis are suggested: (1) the patient had been in the sea or river mouth, (2) no pain was felt after the initial prick and, (3) fang marks were present at the site of the bite. The fang marks are usually around the ankle and appear as one or more pairs of circular dots like the puncture of a hypodermic needle. There is no swelling, bruising or tenderness around them. In contrast, fish stings are always extremely painful and tender. A specific antivenene for sea-snake poisoning is not available and the antivenenes ordinarily available for treatment of snake bite in Eastern countries (bivalent against cobra and Russell's viper venoms) are of little or no use.

It is suggested that if a serum containing an anti-krait venom fraction is available this might be tried, as the symptoms of sea-snake poisoning in some degree resemble those due to krait venom. The advisability of undertaking the preparation of a specific antivenene against the poisons of sea-snakes is indicated. In the absence of a suitable antivenene the most valuable method of treatment of severe cases will be the use of artificial respiration with intubation or tracheotomy if necessary as in the case of paralysis of respiration from other causes.

The question of the safety of bathing in localities where sea-snakes are common is discussed. It is recognized that sea-snakes are rarely aggressive, and as experience has shown that bites are rare even in places which are constantly used for bathing the author considers the risk to be remote. He, however, suggests that it would be advisable to avoid bathing in river mouths where a certain number of cases of sea-snake bite have been noted to occur. *J. Taylor*

Mills, A. R. **Poisonous Fish in the South Pacific.** *J. Trop. Med. & Hyg.* 1956, May, v. 59, No. 5, 99–103.

Fish poisoning has been known in the Pacific since the discovery of Espiritu Santo in the New Hebrides in 1606 by Quiros. It was alluded to by Capt. James Cook who, together with his crew, suffered from it on two occasions. One hog and one dog which partook of one of these fish also succumbed.

Poisonous fish, as is well known, are of two types: those whose flesh is poisonous and those which can inflict poisonous wounds. The flesh of the former may be pleasant to eat and the type of poisoning which results must not be confused with that caused by a dish contaminated with food-poisoning organisms. Poisonous fish have been recorded from most Pacific Isles, S. Africa, Puerto Rico and Cuba. Barracuda poisoning is well known in Jamaica and the Bahamas.

The local variation is remarkable. On the coast of Espiritu Santo many poisonous fish are caught in the Segond Canal, but at Shark Bay, only 20 miles away, these same fish are innocuous. At one point poisonous mullet (*Mugil cephalus*) is found, but it is not poisonous elsewhere in the group of islands.

Fish living or feeding on coral reef are apt to be poisonous, but those in the deep sea are mostly safe. One of the snapper family is very poisonous, and the coral bream (*Phlectorhinchus*) is deadly. In the puff toad (*Tetradon maculatum*) the poison is confined to the genitalia. In the New Hebrides fish are most dangerous during the months of April to July.

Poisoning may be mild or very severe. The outstanding features are myalgias, with alterations in the sense of taste. Temperature may be slightly raised and there is excessive salivation. Extreme muscular weakness is present. The deep reflexes are absent; next a toxic rash with

intense pruritus appears. The most severe form is accompanied by paralysis and coma. At the onset castor oil is given. Oily foods should be taken, while promethazine diminishes the itching. Local remedies are the Malay apple (*Eugenia malaccensis*) and the breadfruit (*Artocarpus communis*).

Although there are many theories to account for the toxicity the author believes that it is due to feeding on plankton of local distribution.

Venomous fish are usually excellent food, and the bigger they are, the worse the sting. Fish of the genus *Muraena* have large teeth in relation to a poison sac which secretes a venom. The sting rays inflict wounds by barbed spines in their tails. In the New Hebrides stings from the stone fish (*Synanceja trachynis*) and the lion fish (*Pterois volitans*) are the most common. The pain is immediate and severe. The injured part is swollen, pale and tender. The symptoms resemble those of snake bite of the viperine type. Urticaria may ensue. Stings in the fingers from the lion fish may be incapacitating. The most dangerous creature, however, is the cone shell (*Rollus geographus*) whose sting can prove fatal.

Philip Manson-Bahr

Wiener, S. **The Australian Red Back Spider** (*Latrodectus hasseltii*): **I. Preparation of Antiserum by the Use of Venom adsorbed on Aluminium Phosphate.** *Med. J. Australia.* 1956, May 5, v. 1, No. 18, 739–42, 5 figs.

"1. The venom of the Australian red-back spider (*L. hasseltii*) can be adsorbed on aluminium phosphate.

"2. The venom thus adsorbed can be used for the production of antivenene in rabbits.

"3. After three injections of adsorbed venom obtained from 25 spiders over a period of five weeks, an antivenene was produced, one cubic centimetre of which neutralized more than one milligramme of venom."

TOXOPLASMOSIS

Hewson, G. E. **Toxoplasmosis.** *Irish J. Med. Sci.* 1956, June, 6th Ser., No. 366, 259–70, 2 figs. [70 refs.]

The author, from County Mayo, gives details of 7 patients suffering from ocular disease whose sera reacted to the *Toxoplasma* dye test in titres from 1 in 4 to 1 in 32. One patient, a woman of 25, had a bilateral healed chorioretinitis and her serum was positive at 1 in 19 in the dye test and 1 in 16 in the complement-fixation test: her mother and brother reacted to the dye test at 1 in 9 and 1 in 24, respectively. This case was believed to have been a toxoplasma chorioretinitis. Another patient showed rising

serum titres in the dye test from 1 in 9 to 1 in 26. The remaining patients were probably not suffering from toxoplasmosis.

The author reviews the literature and the principal features of the disease and makes the point that toxoplasmosis may be more common in Ireland than has previously been believed. *H. J. O'D. Burke-Gaffney*

See also p. 1227, Reusse, Konservierung einiger tierpathogener Protozoen durch Aufbewahrung bei tiefen Temperaturen. [**Preservation at Low Temperatures of Protozoa Pathogenic to Animals**]

Roger, F., Giroud, P. & Roger, Annie. Remarques importantes sur la fixation du complément dans la toxoplasmose humaine ou expérimentale. Supériorité de l'antigène pulmonaire souris sur les antigènes: péritonéal souris, pulmonaire lapin ou chorio-allantoidien. [**Complement-Fixation in Human and Experimental Toxoplasmosis; Superiority of Mouse-Lung Antigen Over Other Antigens**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 6, 807–10.

The authors discuss the trouble they have had with complement-fixing antigens prepared from chorio-allantoic membrane, mouse peritoneal exudate, rabbit lung and mouse lung, because of anticomplementary properties, non-specificity, the difficulty of providing a satisfactory control and the possibility that the animal antigens might harbour a virus. The chorio-allantoic membrane has been abandoned on account of its poor antigenicity and, of the 3 animal antigens, the mouse lung antigen in the authors' hands gives the most satisfactory results. *I. A. B. Cathie*

Giroud, P., Roger, F. & Bogacz, J. A propos de l'utilisation de la terramycine dans le traitement des affections tropicales: son activité contre le toxoplasme; bilan des résultats obtenus. [**Terramycin in Tropical Diseases; Activity against Toxoplasms; Results**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 6, 804–6.

In an earlier article (*C. R. Acad. Sci.*, 1951, v. 232, 1457) the authors suggested that Terramycin [oxytetracycline] might be a very useful drug in the treatment of toxoplasmosis, and as other workers have not been able to confirm these findings the question was investigated again in rabbits and mice. It was noted that peritoneal exudate was unsuitable as the infecting material, and infected mouse brain was therefore used as the source of toxoplasms. The two sorts of animals were treated parenterally with oxytetracycline in doses ranging from 20 to 500 mgm. per kgm. per day. Clear-cut results were obtained with 200 mgm. per kgm. per day for 8 days. According to the dosage employed, the antibiotic either had no effect or caused a chronic infection, or, in toxic doses, killed the parasite.

[No experimental data are presented.] *I. A. B. Cathie*

Erhardová, B. Nachweis toxoplasmaähnlicher Parasiten bei der Rötelmaus *Clethrionomys glareolus*. [*Toxoplasma*-**like Parasites in the Brain of Voles,** *Chlethrionomys glareolus*] *Folia Biol.* Prague. 1955, Nov. 30, v. 1, No. 6, 381–2, 1 pl. [12 refs.]

In smears of the brain of two bank voles, *Chlethrionomys glareolus*, from Czechoslovakia, were found crescent-shaped parasites, the structure of which resembled that of *Toxoplasma gondii*. However, in the vole parasite the nucleus was situated near one of the poles of the body and its pseudocysts were larger than those of *T. gondii*. Because of these differences, the author regards it as a new species for which the name *T. glareoli* sp.n. is proposed. The new parasite is depicted in a plate.

C. A. Hoare

TROPICAL OPHTHALMOLOGY

Budden, F. H. **A Standard of Blindness for Primitive People.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1956, May, v. 50, No. 3, 243–5.

This is a useful review of the methods commonly used for the estimation of visual acuity, together with a discussion of the difficulties encountered in estimating vision in primitive communities. In an under-developed country there is a close relationship between visual acuity and occupation and the results show that though no rigid definition of " economic " blindness in terms of visual acuity is possible, ability to count fingers up to and including 3 metres is a reasonable standard to choose. *D. P. Choyce*

World Health Organization. Technical Report Ser. No. 106. **Expert Committee on Trachoma. Second Report.** Geneva, 7–14 September 1955. 20 pp. Geneva: 1956, May. [Sales agent for U.K., H.M. Stationery Office.] [1s. 9d.; $0.30; Sw.fr. 1.–.]

The World Health Organization Expert Committee is comprised of experts, including some of the most famous ophthalmologists in the world. Their Second Report should be read in entirety by those intimately concerned with the problems presented by trachoma. This report underlines certain outstanding difficulties, notably the fact that the causative agent has yet to be successfully propagated *in vitro* or in some convenient laboratory animal. It recommends an urgent programme of research to try to bring this problem to early solution, involving the close collaboration of ophthalmologists and virologists working in areas where trachoma is endemic.

There is a valuable table of the conditions with which trachoma is likely to be confused and how it can be differentiated from them.

With regard to treatment the Committee agrees that the results of the trials undertaken to establish the possibility of indirect control of trachoma by an attack upon the associated conjunctivitis seem to be promising. Reports of the results of short-term prophylactic treatment directed to the associated conjunctivitis, and repeated at intervals during the year, as indicated by local seasonal incidence, confirm the earlier work demonstrating that a considerable proportion of cures of the underlying trachoma can be obtained.

To read this report *in toto*, however, is to be reminded of the unsatisfactory state of knowledge concerning this disease which remains the major cause of blindness in tropical and under-developed areas.

D. P. Choyce

TROPICAL ULCER

Meyer, H. E. A. **Intra-Arterial Acetylcholine Injections in the Treatment of Refractory Tropical Ulcers.** [Miscellanea.] *Acta Tropica.* Basle. 1956, v. 13, No. 2, 158–64, 2 figs.

The author, using a variety of techniques, has treated many debilitated patients in Ethiopia suffering from tropical ulcers. Of 4 groups of 25 patients with ulcers roughly equal in size (area between 10 × 10 and 10 × 12 cm.) he obtained the following figures when investigating the use of intramuscular [i.m.] acetylcholine, intramuscular Prostigmin in addition, and intramuscular Priscol [tolazoline], in comparison with those not receiving drugs having a vasodilator action.

	Recovery in days
Acetylcholine i.m.	31
Acetylcholine + Prostigmin i.m.	28
Priscol i.m.	27
No vasodilators in therapy	34

He then tried the effect of treating refractory cases with intra-arterial acetylcholine, using the technique of Singer (*Mitt. Grenzgeb. Med. Chir.*, 1944, v. 47, 69). Patients experienced a burning of the feet immediately after the injection and a feeling of warmth from the 2nd to the 4th day. The author found intra-arterial acetylcholine to be superior to intramuscular therapy in producing an improved blood supply and in promoting healing of the ulcer, except when the circulation of the affected extremity was impaired, and considers that this treatment deserves trial in all patients who have refractory chronic tropical ulcers. Illustrative cases are described, but this part of the work was not part of a controlled series.

Frederick J. Wright

MISCELLANEOUS DISEASES

Altman, H. & Stein, H. **Idiopathic Hypertrophy of the Heart in African Children. A Report of Four Cases.** *Brit. Med. J.* 1956, May 26, 1207–10. [22 refs.]

The clinical details are here presented of 4 patients all of whom presented with congestive heart failure and cardiac hypertrophy and dilatation for which no obvious cause could be found. All 4 patients died and in 3 some degree of endocardial thickening was found at necropsy. There was no evidence of malnutrition as a causal factor, the state of nutrition being apparently above the average of those admitted to the hospital. Although severe liver damage or marked fatty change suggestive of protein malnutrition was not found some degree of fatty change in the liver was present in 2 cases. The aetiology of the cardiac disease remains obscure. [See also this *Bulletin*, 1954, v. 51, 839; 1955, v. 52, 203.] *A. W. Woodruff*

Rose, I. & Gregson, J. D. **Evidence of a Neuromuscular Block in Tick Paralysis.** [Correspondence.] *Nature.* 1956, July 14, v. 178, 95–6, 1 fig.

PARASITOLOGY: GENERAL

Szidat, L. Geschichte, Anwendung und einige Folgerungen aus den parasitogenetischen Regeln. [**History, Application and Some Conclusions concerning the " Laws " relating to the Genesis of Parasites**] *Ztschr. f. Parasitenk.* 1956, v. 17, No. 4, 237–68, 3 figs. [Numerous refs.]

Simitch, T.; Petrovitch, Z.; Richter, B.; Lepeš, T.; Petrović, Z. La faune des parasites intestinaux chez l'homme en Yougoslavie—V. Les parasites intestinaux chez les enfants des écoles primaires de la Serbie [Simitch & Petrovitch]. *Bull. Acad. Serbe des Sci.* Belgrade. 1956, v. 15 (n.s.), Classe Sci. Méd., No. 3, 53–4. VI. Les parasites intestinaux chez les enfants scolaires de Bosnie et Hercegovine [Simitch, Richter, Petrovitch & Lepeš]. *Ibid.*, 55–6. VII. Les parasites intestinaux chez les enfants scolaires de Dalmatie [Simitch, Richter, Petrović & Lepeš]. *Ibid.*, 57. [**Intestinal Parasites in Man in Yugoslavia: V, VI, VII. Intestinal Parasites in Schoolchildren in Serbia, in Bosnia and Hercegovina and in Dalmatia**]

Le Gac, P. & Lamy, L. Présentation d'un organisme observé dans un frottis de sang humain. [**An Organism observed in Human Blood Film**] *Bull. Soc. Path. Exot.* 1955, v. 48, No. 6, 828–9, 2 figs. on pl.

In Romanovsky-stained blood films from a patient who resided in Indo-China, and who was suffering from a febrile condition which later proved to be due to smallpox, the authors found a micro-organism represented by banana-shaped bodies measuring, on the average, 20–21 μ × 2·5–3 μ, with a nucleus situated in the centre. As these bodies were lying free among the blood cells in groups of 6 or 7 in the neighbourhood of leucocyte nuclei, it is suggested that they had originally been within leucocytes, from which they were released when these cells ruptured in the course of preparation of the blood films.

According to the authors, these elements are neither fungi nor yeasts, and could not have been deposited by flies. However, they show some resemblance to the bodies described from man by Archibald and Susu [this *Bulletin*, 1924, v. 21, 775] and Zlotnick [*ibid.*, 1956, v. 53, 669], and probably represent Sporozoa, though their precise nature could not be determined. The appearance of these organisms is shown in 2 photomicrographs. *C. A. Hoare*

Rousselot, R. **Notes de parasitologie tropicale. Vol. I. Parasites du sang des animaux. Vol. II. Ixodes.** [Notes on Tropical Parasitology. Vol. I. Blood Parasites of Animals. Vol. II. Ticks.]

This book is reviewed on p. 1292.

ENTOMOLOGY AND INSECTICIDES: GENERAL ZOOLOGY

[Papers on the toxic effects of insecticides in man are abstracted in the *Bulletin of Hygiene* under the general heading of Occupational Hygiene and Toxicology.]

Ovazza, M.; Hamon, J.; Neri, P.; Grenier, P. Contribution à l'étude des diptères vulnérants de l'Empire d'Éthiopie. I. Culicidae [Ovazza, Hamon & Neri]. *Bull. Soc. Path. Exot.* 1956, Jan.–Feb., v. 49, No. 1, 151–82, 8 pls. [Numerous refs.] II. Simuliidae. Simulies et onchocercose [Grenier & Ovazza]. *Ibid.*, 182–96, 3 figs. III. Tabanidae [Ovazza]. *Ibid.*, 197–204, 2 figs. IV. Glossinae [Ovazza]. *Ibid.*, 204–9, 1 map. [**A Study of the Biting Flies of Ethiopia: Culicidae, Simuliidae (and Onchocerciasis), Tabanidae, Glossinae**]

These papers are mainly entomological and contain lists of species, locality records, ecological information and taxonomic details of the

Culicidae (about 60 species), Simuliidae (15 species), Tabanidae (14 species) and *Glossina* (5 species and 1 undetermined) which were collected in Abyssinia during the years 1953–55. Also included are illustrated descriptions of certain morphological details of some, either new or previously undescribed, larvae, pupae and adults of these insects.

In the section on Simuliidae a map shows the known distribution in Abyssinia of *Simulium damnosum*, *S. woodi* and human onchocerciasis. West of the river Gibbe at an altitude of 1,000 to 1,500 metres (3,280 to 4,900 feet) the climate is hot and humid and rain falls on 300 days in the year. Both these species are present, *S. damnosum* during 11 months out of 12. They attack man and onchocerciasis is present. The territory between the river Gibbe and Addis Ababa lies at 1,900 to 2,400 metres (6,200 to 7,800 feet) above sea level. The climate is tropical with 2 rainy periods. *S. damnosum* is present but does not attack man and there is no onchocerciasis. In a third zone, shown on the map to be East of Addis Ababa, the land is about 1,000 metres (3,280 feet) altitude; here the climate is hot and dry. *S. damnosum* is present, and bites man for only 5 weeks to 2 months in the year and there is no onchocerciasis.

It is suspected that in Abyssinia *S. damnosum* will not attack man above 1,800 metres (5,900 feet) but this needs confirmation.

Four species of tsetse were collected in the west: *Glossina tachinoides*, *G. palpalis fuscipes*, *G. morsitans* and *G. pallidipes*. A map shows the places of capture of these species, and also of *G. longipennis* and an unnamed species. The authors have no data on either animal or human trypanosomiasis in this region. *H. S. Leeson*

Simmons, S. W., Hayes, G. R., Jr. & Hess, A. D. **The Pest Mosquito Problem and its relation to Public Health.** *Mosquito News.* 1956, June, v. 16, No. 2, 53–8. [12 refs.]

Schubert, J. H. & Holdeman, Lillian V. **A Modified Precipitin Technique for determining the Source of Mosquito Blood-Meals.** *Amer. J. Trop. Med. & Hyg.* 1956, Mar., v. 5, No. 2, 272–3.

Improvements on the capillary precipitin technique have given increased definition and reliability of results by the use of smaller capillary tubes (1·2 to 1·5 mm. OD), involving correspondingly smaller quantities of antisera. The difficulty of contamination between antigen and antisera has been largely overcome, and the entire technique facilitated.

Antisera are prepared from rabbits by intravenous injection of incremental doses of specific serum, and tested for activity by reciprocal titre. If satisfactory, antiserum is collected and stored with 1:10,000 merthiolate [thiomersal] as preservative. Antisera are used at the maximum

dilution which gives distinct precipitation, without cross-reactions, when tested in glycerinated saline solution against homologous and heterologous sera at 1:500 dilution in physiological saline. Crushed mosquitoes to be tested are prepared as standard suspensions in 0·5 ml. of physiological saline. The test suspension is drawn into the capillary tube, followed by antiserum at optimal dilution in glycerinated saline as previously determined, to give a column an inch in length. Excess liquid is removed, the column of test mixture is centred in the capillary, and the tube fixed in a vertical position in such a way that air spaces remain above and below the mixture. Precipitation occurs at the antigen-antiserum interface after 1 hour, and agglutination takes place overnight at room temperature. The method has the additional advantage that the capillary tubes employed can be discarded after use.

N. R. Phillips

Bishop, Ann, Hartree, E. F. & McConnachie, Elspeth W. **A Method for determining the pH of Small Quantities of Fluid.** *Parasitology.* 1956, May, v. 46, Nos. 1/2, 216–19, 1 fig.

The micro-glass electrode used for measuring the *p*H of blood from the stomachs of mosquitoes consisted of a thin-walled capillary tube coated with shellac and protected by a wider and shorter hard-glass thick-walled capillary. The electrode was insulated by coating and sealing the junctions of the capillaries with picene wax. The inner capillary was filled with N/10 HCl, one end was sealed, and from the other end a silver wire was inserted.

The calomel electrode assembly was made from a polythene tube drawn out to a capillary, with agar-KCl at the tip to form a plug and saturated KCl solution + solid KCl in the upper part. The calomel electrode was fixed in the wider portion of the tube by a rubber bung.

The fluids for measurement were collected in hard-glass capillaries of diameter slightly greater than the exposed capillary of the electrode. The end of the capillary was drawn out to a fine point, through which the sample entered the tube. The glass electrode was inserted at the upper end. The tip of the capillary container and of the polythene sheath were thrust into a stiff agar-KCl gel in which the containers would stand upright; they were adjusted under the microscope. Samples as small as 0·005 ml. sufficed for the determination. *J. H. Birkinshaw*

Adam, J. P. & Hamon, J. Trois Anophèles nouveaux pour le Cameroun (*A. hargreavesi*, *A. freetownensis* et *A. jebudensis*). [**Three New Records of Anophelines from the Cameroons** (*Anopheles hargreavesi*, *A. freetownensis* **and** *A. jebudensis*)] *Bull. Soc. Path. Exot.* 1956, Jan.–Feb., v. 49, No. 1, 71–6. [12 refs.]

Peters, W. & Cornelius Dewar, S. **A Preliminary Record of the Megarhine and Culicine Mosquitoes of Nepal with Notes on their Taxonomy (Diptera: Culicidae).** *Indian J. Malariology.* 1956, Mar., v. 10, No. 1, 37–51, 3 figs. [15 refs.]

Laven, H. **X-Ray Induced Mutations in Mosquitoes.** *Proc. Roy. Entom. Soc. of London.* Ser. A. 1956, Mar. 19, v. 31, Pts. 1/3, 17–19, 8 figs. on pl.

The author describes a successful attempt to produce mutants of *Culex pipiens* by the irradiation of 2 to 3-day-old males with X-rays at a dosage of 4,000 röntgens. Four mutant strains have been produced and are being maintained in the laboratory. The object of the investigation was primarily to obtain mutants which would allow the marking of the chromosomes of the mosquitoes and so facilitate the study of such problems as the inheritance of susceptibility to infection with malarial parasites, of insecticide resistance, and of reproductive incompatibility between different populations such as has been encountered between various European and American populations of *Culex pipiens* [this *Bulletin*, 1955, v. 52, 585]. The four mutations, which are described in detail, seem to mark all the existing chromosomes in *Culex* with at least one gene, *i.e.*, the two autosomes and the sex chromosome of each sex. Other mutations have been encountered but their mode of inheritance has not yet been fully worked out. *W. H. Potts*

Melis, R. & Catella, F. Prima applicazione di lotta adulticida su vasta scala contro le zanzare (*Culex pipiens* L.) in una zona di villeggiatura marina. [**Large-Scale Control of Adult** *Culex pipiens* **in a Seaside Holiday Resort in Italy**] *Igiene e San. Pubblica.* Rome. 1955, Nov.–Dec., v. 11, Nos. 11/12, 582–9. English summary (8 lines).

The authors describe a heavy treatment against adult nuisance mosquitoes (described as *Culex pipiens*) breeding near the sea coast. The area treated was a strip, 25 hectares in extent, bordering the Adriatic sea and much frequented by holiday makers. About 65 per cent. of this area needed treatment, which was an application of mixed insecticides at the rate of 900 gm. per hectare. The mixture used was DDT, heptachlor and malathion (15 per cent. of each), together with 55 per cent. solvent and emulsifier. This concentrate was diluted in water to 1·25 per cent. and applied by a power-driven spraying machine.

Effects of the treatment were judged by pyrethrum spray catches from small huts dispersed in the treated zone, which acted as catching stations. The average pre-treatment catch of 55 mosquitoes was reduced to 1–2 for the following 2 months (96 to 98 per cent. control). *J. R. Busvine*

HARVEY, A. E. C. **Preliminary Tests with Diazinon against Culicine Larvae in Septic and Waste Water Tanks.** *East African Med. J.* 1956, Apr., v. 33, No. 4, 117–23.

In East Africa, *Culex fatigans* breeds in large numbers inside septic tanks which have become accessible through neglect. Control of this mosquito with such larvicides as HS oil and DDT emulsion is unsuccessful. An attempt was made to investigate the usefulness of Diazinon as a larvicide under these conditions.

In the laboratory a dosage of 1 p.p.m. gave 100 per cent. mortality in a 24-hour exposure. In a few field trials, septic tanks were treated at the rate of 2 p.p.m., the volume being the total capacity of the two compartments of the tank. (Breeding usually occurs only in the second of the two compartments.) The insecticide was poured into the lavatory bowl and flushed. Tests were also made, at a dosage of 1 p.p.m., on waste water tanks and soakage pits which collect water from the kitchen and bathroom.

The results show that in septic tanks Diazinon is effective up to about 3 weeks, while in waste water tanks protection may last rather longer.

W. Z. Coker

O'ROURKE, F. J. **Observations on Pool and Capillary Feeding in *Aedes aegypti* (L.).** [Correspondence.] *Nature.* 1956, June 9, v. 177, 1087–8, 1 fig.

The time taken for *Aëdes aegypti* to engorge on human volunteers was noted for 140 female mosquitoes. The graph shows a bimodal curve with about 60 per cent. of the mosquitoes requiring about 2 minutes and the remainder about 4 to 5 minutes to engorge. It is suggested that these represent, respectively, mosquitoes which fed directly from capillaries and those imbibing from an intercapillary pool of blood in the tissues of the host. The results are discussed in the light of direct experimental observations by others of *A. aegypti* feeding on the web of a frog and a mouse's ear [this *Bulletin*, 1940, v. 37, 653; 1953, v. 50, 460].

D. S. Bertram

DOBY, J. M., DEBLOCK, S. & GAEREMYNCK, L. Régime alimentaire et sensibilité des larves d'*Aedes aegypti* au D.D.T. Influence du taux des lipides de l'organisme. [**Diet and Susceptibility of *Aëdes aegypti* Larvae to DDT; Effect of Lipoid Levels in the Larvae**] *Bull. Soc. Path. Exot.* 1956, Jan.–Feb., v. 49, No. 1, 56–64, 4 charts.

According to MER and FURMASKA [this *Bulletin*, 1954, v. 51, 229], the resistance of house-flies to insecticides was augmented by increasing the richness of their diet, which raised the lipoid content of the flies. The authors have investigated this possibility in mosquito larvae. Eggs of

Aëdes aegypti, from the same parents, were divided into groups which were reared on the following diets: (1) a suspension of wheat flour, rich in carbohydrates; (2) a suspension of milk powder, rich in protein and lipoids; (3) an extract of green algae, rich in chlorophyll but with little protein or lipoid; (4) a suspension of dried brewers' yeast.

At various stages (II, III or IV) the larvae were exposed to DDT suspensions for 18 hours and then replaced in normal medium. Subsequent mortalities were recorded for a week. In all cases mortality was lower or was delayed in the larvae reared on wheat flour; the other diets gave about equal results. Lipoid determination of the larvae from various diets gave the following contents: (1) (flour) 7·7 per cent.; (2) (milk) 11·2 per cent.; (3) (algae) 4·4 per cent.; (4) (yeast) 5·9 per cent. These figures do not suggest that lipoid content is related to resistance to DDT, in *Aëdes* larvae. *J. R. Busvine*

Chandler, A. C. **History of *Aedes aegypti* Control Work in Texas.** *Mosquito News*. 1956, June, v. 16, No. 2, 58–63.

Lewis, D. J. **Chironomidae as a Pest in the Northern Sudan.** *Acta Tropica*. Basle. 1956, v. 13, No. 2, 142–58, 2 figs. [Numerous refs.]

The non-biting midges have been recorded as nuisances in Africa, Europe and the U.S.A. In the Sudan the prevalence of a species of *Tanytarsus* is associated with outbreaks of asthma, and asthmatics showed a high proportion of strongly positive reactions when tested with antigens prepared from *Tanytarsus*. In 1948 at Wadi Halfa 14 out of a permanent hospital staff of 67 were incapacitated throughout the Chironomid season. Chironomids were first recorded as pests here in 1938. The first record of Chironomids as pests at Khartoum was in 1927 (possibly 1926). These years follow closely the first operations of the Jebel Auliya dam (1937) and the Sennar dam (1925), and the author suggests the possibility that lake-like conditions along the Nile may be breeding foci. Drifting pupae may accumulate at certain places and from these foci the midges are carried into the towns by wind. The numbers of midges vary from year to year, and it is suggested that records of "good" and "bad" years could be usefully kept with particular reference to future damming operations along the Nile. The Chironomid season is between November and June. A suggested solution to the problem is that a tree barrier between the river and human habitation might prevent the midges being carried to the towns by prevailing winds.

A more detailed paper by the author on Chironomidae and preventive measures is in preparation. *B. R. Laurence*

Kilpatrick, J. W. & Bogue, M. D. **Adult Fly Production from Garbage Can Sites and Privy Pits in the Lower Rio Grande Valley.** *Amer. J. Trop. Med. & Hyg.* 1956, Mar., v. 5, No. 2, 331–9, 1 fig.

Flies were trapped for 11 months, beginning October 1951, as they emerged from the soil under and near garbage containers, and from privy pits, in 4 towns in Texas. Differences in the numbers of house-flies emerging from privy pits were found between towns. In one town *Musca domestica* accounted for approximately 87 per cent. of the flies emerging; in another only approximately 20 per cent. were house-flies. The greater abundance of flies breeding in privy pits in some towns appeared to be associated with a greater degree of resistance to dieldrin, and it is suggested that insecticide resistance may be linked with a physiological change in breeding behaviour [see also Schoof and Siverly, 1954, this *Bulletin*, 1955, v. 52, 221]. Increase in privy breeding in 2 towns over the short period of the investigation was associated with increase in insecticide resistance. *Sarcophaga* was the most abundant genus of fly emerging from abandoned privy pits and *Phaenicia* (*Lucilia*) the most abundant bred from the soil around garbage cans. *B. R. Laurence*

Ross Institute Industrial Advisory Committee. London School of Hygiene and Tropical Medicine. Information and Advisory Service. 1956, Mar., Bull. No. 5, 23 pp., 12 figs. [Originally issued Nov. 1950, revised Feb. 1953.] **The Housefly and its Control.**

In this revised issue of the Ross Institute's bulletin [this *Bulletin*, 1952, v. 49, 558] on the house-fly there is little change except in the information about insecticidal treatment for the control of this insect. Some paragraphs on this subject have had to be rewritten owing to the discovery of newer insecticidal compounds and the seemingly growing menace of resistance.

Though DDT kills the adult fly it does not readily kill the maggots; therefore BHC or dieldrin, which are effective against both stages, are recommended for the treatment of breeding places. If, however, the flies which are attracted to manure and garbage dumps have become resistant to insecticides of the chlorinated hydrocarbon group, such as DDT, BHC and chlordane, then malathion, of the organic phosphate group, should be used. As the residual capacity of malathion is limited to a few days, applications of this insecticide will have to be made twice a week. The residual effect of malathion may be extended to a fortnight by the addition of sugar to a "spot spray" used wherever flies are known to rest.

Organic phosphates are toxic substances, though malathion is one of the least toxic of the group, and they should not be used in the vicinity of food or food products. Research continues to seek new compounds of

this group which will be less toxic to mammals and highly lethal to insect pests including the house-fly.

The knock-down and lethal effects of aerosols are enhanced by the inclusion, with the pyrethrum, of a synergist, piperonyl butoxide; these sprays are only slightly affected by the resistance problem.

Nevertheless, it is still emphasized that trapping of flies and their larvae and the use of insecticides, however efficient, can never compensate adequately for any neglect of the well-known measures of sanitary disposal of garbage and of animal and human waste matter.

H. S. Leeson

Levinson, Z. H. **Chemicals affecting the Preimaginal Stages of the Housefly. VI. Further Tests with Highly Chlorinated Aliphatic and Alicyclic Compounds.** *Riv. di Parassit.* Rome. 1956, Jan., v. 17, No. 1, 51–7, 1 fig.

The volatile octachloropropane has been shown to be highly toxic in the vapour phase to house-fly larvae and pupae, while the comparatively non-volatile dekachlorobutane exhibits remarkable contact toxicity to third stage larvae. Tests have been made with other highly chlorinated C4–, C5– and C6– compounds to see if any more are toxic to house-fly larvae.

As larvicides, the method employed was to incorporate the chemical in the breeding medium (wheat bran) in concentrations of 5,000, 2,000, 1,000, 500, 250, 100 and 50 p.p.m. Approximately 7 gm. of the treated medium was added to a test-tube and 10 3-day-old larvae of *Musca vicina* introduced. The stoppered test-tube was incubated at 35 ± 0·5°C. for 24 or 48 hours. Toxicity in the vapour phase was tested by exposing third stage larvae for 24, 15, 3 and 2 hours, and 1-day-old pupae for 24 hours in an atmosphere saturated with the vapour of the compound tested.

The results show that as larvicide, hexachlorobutadiene was highly lethal causing almost 100 per cent. mortality in 100 p.p.m. after 48 hours; dekachlorobutane gave 100 per cent. kill after 48 hours' exposure to 500 p.p.m., and was completely ineffective at 100 p.p.m. Next in order of toxicity were pentachlorobutadiene and hexachlorocyclopentenone killing all specimens at 1,000 p.p.m. Hexachlorobutane, octachloropentadiene, nonachloropentene and octachlorocyclopentene were of negligible toxicity. The chlorinated C6– compounds were entirely non-toxic. In the vapour phase the 3 compounds hexachlorocyclopentenone, hexachlorobutadiene and pentachlorobutadiene were the only toxic agents, the efficiency being in that order at exposure period of 3 hours. These 3 compounds were found to be the most highly volatile.

W. Z. Coker

Koide, S. S. **Myiasis from *Oestrus ovis*. Report of Three Cases.** *Hawaii Med. J.* 1956, May–June, v. 15, No. 5, 460–61.

" Three cases of myiasis of the eyes and nostril by the larvae of Oestrus ovis (Linnaeus) are reported. The larvae removed from the eyes, as well

as that obtained from the nostril 13 days later, were alive and in the first instar. Predominant symptoms were catarrhal conjunctivitis, paroxysms of sneezing and coughing, rhinorrhea and sensation of moving bodies in the eyes and nostril."

Silva-Campos, R. Hallazgos de larvas de *Tubifera tenax* (*Eristalis tenax*). [**The Finding of** *Tubifera tenax* (*Eristalis tenax*) **in Human Faeces**] *Bol. Chileno de Parasit.* 1955, Oct.–Dec., v. 10, No. 4, 75–7, 1 fig.

The English summary appended to the paper is as follows: —

"The finding of three specimens of *Tubifera tenax* (*Eristalis tenax*), claimed by the patients to have been eliminated together with the faeces, is reported. The morphology, biology and the mechanism of transmission of this larva, as well as clinical aspects of human intestinal myiasis are briefly reviewed."

Haddon, W., Jr. **An Artificial Membrane and Apparatus for the feeding of the Human Body Louse** *Pediculus humanus corporis*. *Amer. J. Trop. Med. & Hyg.* 1956, Mar., v. 5, No. 2, 315–25, 4 figs. [15 refs.]

A method suitable for the feeding of *Pediculus*, and other frequently refractory ectoparasitic insects, has been devised without the use of unsterile biological materials. The artificial membrane employed consists of a thin (less than 25 μ) film of gutta percha, bound to a superficial layer of gauze by means of gelatin. This membrane fulfils all the necessary requirements for adequate attachment and penetration by the insect, and is waterproof, plastic and sterilizable; full details for its preparation, with specification of the materials used, are given.

The feeding apparatus (figured) consists essentially of a shallow circular "saucer" of approximate capacity 1·5 ml. The membrane is inserted into this and affixed by petrolatum and a retaining ring, and the previously prepared blood meal introduced into the underlying cavity from a syringe. Trapped air is removed by a second syringe. The insects to be fed are then introduced above the membrane into the upper cavity. Temperature is maintained from below by a water bath.

By this means, numerous *Pediculus* and argasid ticks, and subsequently *Cimex* and *Aëdes aegypti*, have been fed successfully. The conditions of feeding quoted comprise ambient temperatures of 20 to 30°C., and surface temperatures of 33 to 37°C. (optimum 34·4°C.). Various blood meals, water and saline have been used, and the use of alternative membrane materials is discussed. *N. R. Phillips*

Haddon, W., Jr. **The Maintenance of the Human Body Louse** *Pediculus humanus corporis* **through Complete Cycles of Growth by Serial Feeding through Artificial Membranes.** *Amer. J. Trop. Med. & Hyg.* 1956, Mar., v. 5, No. 2, 326–30, 2 figs.

Colonies of *Pediculus* have been successfully reared through a maximum of 2 complete generations by means of haemolysed, defibrinated human blood, supplied through an artificial membrane [see above]. Rearing was unaffected by the addition of 10 units each of penicillin and streptomycin per ml. to the blood meals in one experiment.

Lice were initially derived from a laboratory culture previously reared on rabbits. Unfed first instar nymphs were used to initiate the colonies. Feeding was carried out at ambient temperatures of 26 to 30°C., usually for periods of one hour at approximately 12-hour intervals. Between feedings, the colonies were maintained on cloth pads at 30°C. and 60 per cent. RH.

Initial engorgement of the original nymphs was between 80 and 90 per cent. Overall mortality of these nymphs was between 30 and 40 per cent., and adults of both sexes were produced in similar numbers. The period from first feeding to sexual maturity was between 10 and 14 days, and resulting eggs had a viability of 78 to 88 per cent.

Suppression of the bacterial gut contents occurred in lice which received antibiotics at the dosage stated, but no effect on growth or development was apparent. *N. R. Phillips*

Carrillo, S. J. Situación actual del empleo del Dieldrín en Venezuela. [**Present Status of the Use of Dieldrin in Venezuela**] *Bol. Oficina Sanitaria Panamericana.* 1956, Feb., v. 40, No. 2, 107–27, 12 figs. [12 refs.] English summary.

The English summary appended to the paper is as follows:—

"A study of the past and present use of dieldrin in Venezuela is presented, showing that, while the insecticide is unquestionably useful in a campaign of *Reduvidae* eradication, its effectiveness depends on the complete spraying of all dwellings of any group of persons affected, using one g. per square meter, in cycles of not more than one year, or 0·5 g. per square meter at intervals of not more than six months (3 applications).

"For treating surfaces of porous material, such as *bahareque* (the walls of huts, made of mud and reed), it is recommended that dieldrin in aqueous suspension be applied both inside and outside, especially if the outside walls have cracks that offer shelter or passage to *Reduvidae*.

"Through the application of 0·5 g. of dieldrin per square meter it has been possible to obtain effective control of several house arthropods, a reduction of the rat flea index to 0, and an apparent control of residual or persistent malaria in two states of the Republic.

"Several cases of poisoning occurred in domestic animals, some through accidental ingestion of the insecticide, others through ingestion of insects killed by it. In the case of a cow that was intoxicated and spontaneously cured, it was observed that the insecticide passed into the milk in appreciable quantities.

"There are reasons for attributing the poisoning of 31 members of spraying teams in eight zones up to February 1955 to the penetration of dieldrin through the skin of hands, arms, and torso, as well as the neck and face, and in second line through the naso-laryngeal passage.

"The cases of poisoning seem to be closely related to the following factors: a) disregard of protective measures; b) individual susceptibility, and c) substandard diet. The fatigue factor is not being considered because it is the effect of excess work translated into the number of liters sprayed. An increased quantity of spraying presupposes a greater accumulation of the product either directly on exposed skin or indirectly through the worker's uniform.

"The experience in Venezuela has given rise to methods of diagnosis, therapy, and prevention that will no doubt contribute toward solving the problem of how to make the handling and spraying of dieldrin safer."

LABORATORY PROCEDURES

DAWOOD, M. M. **A Simple Reliable Liver Function Test.** *J. Egyptian Pub. Health Ass.* 1955, v. 30, No. 5, 169–75.

The author has done Lugol's iodine test for liver function [see this *Bulletin*, 1953, v. 50, 1101] on 68 patients in Egypt; he thinks it is reliable and easy to do in the field. *A. R. D. Adams*

MISCELLANEOUS PAPERS

GELFAND, M. **Some Considerations of the Effects of certain African Diseases on the Health of the Population.** *Central African J. of Med.* 1956, May, v. 2, No. 5, 194–8. [15 refs.]

This article is a report of an address to a lay audience. The author contrasts the effect of individual diseases on susceptible people with the relatively slight effect produced in hyperendemic areas on indigenous people by malaria, schistosomiasis and ankylostomiasis. Although

opinions differ as to the degree of morbidity caused (and the author rightly stresses that the slight effect on the group must not be interpreted as necessarily applying to the individual) he quotes reports in support of the general thesis that these endemic diseases may be relatively innocuous. In contrast, malnutrition and, in particular, protein lack may lead to kwashiorkor, cirrhosis of liver and anaemia. In the author's opinion backwardness in education and religion are the greatest handicaps to positive health in Africa. *Frederick J. Wright*

REPORTS AND SURVEYS

Bell, S. **The Ameru People of Kenya. A Medical and Social Study. Part I: Geographical and Ethnological Background.** *J. Trop. Med. & Hyg.* 1955, Oct., v. 58, No. 10, 223–39, map 1. **Part II: The Medical Background. The Changing Background.** *Ibid.*, Nov., No. 11, 249–59. **Part III: Materials and Methods of Study.** *Ibid.*, Dec., No. 12, 280–90, fig. 1 & map 2. **Part IV: Observations: Anthrax, Treponematosis.** *Ibid.*, 1956, Jan., v. 59, No. 1, 5–14, figs. 2–3. **Part V: Treponematosis.** *Ibid.*, Feb., No. 2, 31–40. [24 refs.] **VI: Pulmonary Tuberculosis.** *Ibid.*, Mar., No. 3, 57–65, fig. 4. **Part VII: Relapsing Fever.** *Ibid.*, Apr., No. 4, 82–8, fig. 5. [15 refs.] **Part VIII: Malaria.** *Ibid.*, May, No. 5, 106–12, fig. 6. [12 refs.] **Part IX: Ascariasis. Taeniasis. Ancylostomiasis. Conclusion.** *Ibid.*, June, No. 6, 121–33, figs. 7–9.

This monograph does not purport to give a complete medical survey of the Ameru people of Kenya but rather endeavours to interpret the effect of their culture and environment on health as illustrated by the occurrence of certain selected infections. Those to which special attention is paid illustrate different modes of acquisition. They are listed as follows:—

(i) direct contact with animal hide: anthrax;
(ii) direct contact between human beings: treponematoses;
(iii) indirect contact—droplet infection: pulmonary tuberculosis;
(iv) indirect contact—insect vector—endemic disease: relapsing fever;
(v) indirect contact—insect vector—epidemic disease: malaria;
(vi) indirect contact—infected water or food: ascariasis;
(vii) indirect contact—infected meat: taeniasis;
(viii) indirect contact—infected soil: ankylostomiasis.

In any such interpretation a deep understanding of social customs is necessary. The author had the advantage of serving in a mission hospital in the midst of the Ameru continuously from December 1940 to January 1950, except for a year's absence in 1945. He was thus able to become acquainted with cultural and environmental factors and to penetrate the

barriers of a foreign language and customs in a way which the casual visitor or even a visiting research team may fail to do. As he was working on his own, records were limited to essentials but they have the advantage of continuity and uniformity. This study raises the question of the techniques employed in surveys and whether these would not be better carried out in association with local workers of experience.

The Ameru are Bantu living, for the most part, in primitive conditions but their long established social customs are breaking down under the impact of modern Western civilization. The recent Mau Mau uprising, involving but not originating among the Ameru, is an illustration of the violence which may be engendered and the need for accurate knowledge of social changes and their effect on the health of the community.

With regard to specific problems the author makes a number of notes on diseases seen among in-patients during a 7-year period and comments on present-day practice. These illustrate how quickly advances in treatment are occurring.

The Ameru have two drug addictions, alcohol (obtained from sugar-cane or millet) and the use of the twigs of *Catha edulis*, the source of *miraa* or *khat*, a drug having an amphetamine-like effect.

Anthrax. A total of 105 cases were diagnosed, 104 being cutaneous and 1 intestinal. Only patients with multiple pustules were likely to be severely ill. There were only 5 deaths.

Treponematoses. A total of 571 in-patients suffered from yaws. Syphilis was diagnosed in only 37 in-patients and the majority of these were visiting Boran, nomads from the Northern Province. A few cases of a treponematosis, conveyed by sexual intercourse but showing resemblances both to yaws and syphilis, are described. The author raises the question whether these cases were a form of treponematosis intermediate between yaws and syphilis.

Tuberculosis. The author is critical of the Government's policy with regard to pulmonary tuberculosis but during the period surveyed the most that prolonged chemotherapy could do for the majority was to bring the disease theoretically within the scope of thoracic surgery, an expensive measure of problematic value for a primitive people. [The position is still difficult but prospects for the individual are improving.] He misinterprets the Government's comments on the disappointing results of BCG. These referred primarily to the relatively low proportion among a trial group vaccinated who maintained a positive Mantoux conversion. [Difficulties in the use of BCG in the tropics are being overcome but caution before launching on an alleged protective vaccination in a primitive community is wise if subsequent disillusionment is to be avoided.]

Relapsing Fever. Ornithodorus moubata lives in the dried mud floor of the huts of the Ameru. Morbidity was greatest among infants and the disease was rare in adults over 35 years unless they were visitors to the area. An increase in cases raises the question whether in some

outbreaks the infection may have been maintained and conveyed by lice. In 5 infants referred to the disease developed within 10 days of birth although the infection was not likely to have been conveyed transplacentally. Impregnation of earth floors with benzene hexachloride (Gammexane) destroys the ticks for some months and may prove to be a practicable prophylactic measure. [The abstracter, when visiting this district, was impressed with the popularity of this measure as a means of stopping the skin irritation from which the inhabitants had been lifelong sufferers. Those in control huts were anxious to know when they would be obtaining relief from the bites.]

Malaria. This disease is a major cause of morbidity. There is a seasonal increase in cases and 15 deaths were recorded, mainly from cerebral malaria. There is a potential danger of intermittent spread of infected *Anopheles* to higher areas usually free from malaria.

Ascariasis, taeniasis and ankylostomiasis. These occurred frequently without special features, it being noted that ankylostomiasis is not usually productive of serious ill health in the Ameru.

In his conclusions the author stresses the dependence of such primitive people on the rainfall; failure of the rains leads to signs of malnutrition appearing in the more susceptible members of the community, namely the infants, children and pregnant women. The author finds much that might be improved but before proposing radical environmental changes he advises due thought to be given to the values of an established order. A village may not be hygienic but there is much truth in the words of the elder who defined a good village thus: "A good village is where the head-man and the elders are respected by all; and where they too have regard for all, even for the children. It is a good village where the young respect parents and where no one tries to harm another."

Frederick J. Wright

BOOK REVIEWS

McLetchie, J. L. [C.M.G., O.B.E.], O'Neill, E. N. & Eyre, H. V. [M.B.E., M.R.San.I.]. **Handbook for Dispensary Attendants and Medical Field Unit Assistants.** With Notes on Leprosy by T. F. Davey, O.B.E. pp. viii + 244, 7 figs. 1956. London: Geoffrey Cumberlege, Oxford University Press, Amen House, Warwick Square, E.C.4. [7s. 6d.]

As Sir Samuel Manuwa states in a foreword, this book sets out to give the basic knowledge required by African medical auxiliary trainees with no more than elementary education. After brief chapters on physiology and anatomy, individual diseases and their treatment are described, and there follow chapters on various aspects of rural hygiene and public health, water supplies, epidemic disease control, dispensing, and first aid.

There are four pages of line drawings. The book is, by design, shorter and simpler than other well known books for African medical auxiliaries.

It is very much easier to criticize a book of this nature than to write it. The writer of this review, after some years' experience with very similar trainees, can express sincere admiration of the clarity with which everything is explained (knowing, particularly, the difficulty inherent in putting medical knowledge over to men lacking knowledge of the basic terms used in chemistry). To single out one aspect of outstanding practicality, it is evident that the treatment, or disposal, of individual diseases has been described specially for men who work in the bush by men who have spent their lives working in the bush. A few suggestions may, however, be made for possible improvement.

The African, lacking laboratory and radiological aids while training, often acquires an acuter appreciation of clinical signs than most doctors possess; clinical descriptions, therefore, especially as regards differential diagnosis, might well be given in more detail. The relative importance and commonness of different diseases, too, could receive more attention: *e.g.*, lobar pneumonia is an epidemic disease in the dry season, characterized by faster pulse and respiration in relation to the temperature than typhoid, which in its first week may otherwise be somewhat similar.

More stress might be laid on the principles underlying mass campaigns against endemic diseases such as yaws, etc.

It is stated that the trainee will have access to standard textbooks during his training, to supplement the detail given in this book. Nevertheless, for most of his working life this will be the only book to which he can refer in an emergency or when a rarity appears under the microscope. More detail about the treatment of snakebite (and scorpion stings) *and* their appearance in the index, would be welcome. The addition of coloured plates, no doubt, would raise the price unduly, but could not more line drawings be included? Those of the helminth ova on page 238 are quite clear enough for reference, and the same artist should be able to draw the malarial parasites, microfilariae and more rare intestinal ova.

The men for whom this book is intended are practising medicine, often with only occasional supervision by a doctor. An introductory statement of the Hippocratic principles would not be out of place. No one applies them more sincerely than the well trained Medical Field Unit worker.

B. B. Waddy

Rousselot, René. **Notes de parasitologie tropicale. Vol. I. Parasites du sang des animaux.** 152 pp., numerous figs. **Vol. II. Ixodes.** 134 pp., numerous figs. [Notes on Tropical Parasitology. Vol. I. Blood Parasites of Animals. Vol. II. Ticks.] 1953. Paris (VI^{e}: Vigot Frères, 23, Rue de l'École-de-Médecine. [44s.]

The first of these volumes contains a systematic account of parasites (chiefly protozoa, rickettsiae, spirochaetes, certain microfilariae, and

other organisms of uncertain systematic position) of the blood and the blood vessels of domestic animals and wild vertebrates encountered by the author during sojourns in French West Africa (1942–45), Iran (1946–47), and French Equatorial Africa (1948–52). The amount of detailed information given in this study is very considerable and all that is possible within the compass of a short review is to give a brief summary of the extent and the scope of the work. Although it is not in any way a textbook it should prove indispensable to veterinary workers operating not only in West Africa and the neighbouring territories but also further afield.

The section devoted to Iran is mostly limited to an account of studies carried out in the region of Teheran. The sections dealing with French Equatorial Africa and French West Africa are much more important and detailed. In the case of the French Colonial territories a useful list is given of the blood protozoa and rickettsiae hitherto described from these areas and the hosts from which they have been recorded. The text is illustrated. The bibliography although helpful is incomplete.

The author redescribes the already known species of pathogenic blood parasites of these regions and adds to his descriptions useful clinical notes, observations on treatment and experimental data on many of the organisms. The technique of splenectomy in birds, as used by him, is described.

Among the new species described and named from French West Africa are several *Pirhemocyton* spp. from reptiles, a *Nuttallia* sp. from a gerbil, a *Luhsia* sp. from a white rat, a *Hepatozoon* sp. from a spermestes, a *Haemogregarina* sp. from a chameleon and a *Trypanosoma* sp. from a bird. A new *Piroplasma* sp. is described from a striped rat collected in French Equatorial Africa. New species described and named from Iran are a *Luhsia* sp. and a *Rickettsia* sp., both from a merion, a *Piroplasma* sp. from a partridge and a *Bartonella* sp. from a trout.

The second volume contains descriptions of all the species of ticks collected by the author in French West Africa and French Equatorial Africa during the years 1942–45 and 1948–52. Descriptions (in many cases illustrated with figures) are given of 2 species of *Ixodes*, 17 of *Rhipicephalus*, 4 of *Hyalomma*, 6 of *Amblyomma* and 3 of *Haemaphysalis*, and of *Palpoboophilus decoloratus*, *Boophilus congolensis*, *Dermacentor circumguttatus* and *Aponomma exornatum*. These descriptions include not only all the commonly occurring ticks of these territories but also descriptions of a few uncommon species. Four species of *Argas* are recorded but not described, and short morphological notes are given on *O. erraticus*, *O. moubata* and *O. savignyi*. No tick new to science is described.

In the case of many of the species of ixodid ticks, notes are given on their biology and relationship to the transmission of disease. Experiments on the egg toxin of *P. decoloratus* are described and an account is given of a toxin which killed guineapigs, sheep and a goat but had no lethal

effect on a calf. Notes are given on the life cycle of *O. moubata* and *O. savignyi*, the production of coxal fluid by the former species of tick and the transmission of *Spirochaeta anserina* by the bite of *O. moubata*.

The technique of collecting, preserving and examining ticks and the methods used in breeding ixodid and argasid ticks are dealt with in a short section. In addition a complete catalogue of the ticks of French West and Equatorial Africa and their hosts, and a list of the pathogenic organisms which they transmit, are given together with a table indicating, where this is known, whether the tick is a one-, two- or three-host tick.

The general account of the morphology of ticks, the keys which are given to the genera and species and the extensive bibliography, make this a work which should be in the hands of all veterinary and medical research workers concerned with the study of the ticks of Western Africa.

M. M. J. Lavoipierre

Fernald, H. T. & Shepard, H. H. **Applied Entomology. An Introductory Textbook of Insects in their relations to Man.** 5th Edition. pp. ix + 385, frontispiece & 270 figs. 1955. New York: McGraw-Hill Book Co., Inc. [$7.00; 52s. 6d.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1956, May, v. 44, Pt. 5, 67.]

This fifth edition of a work already noticed has been brought up to date by numerous text alterations. The section dealing with insecticides (pp. 44–59) has had be completely rewritten, as the fourth edition appeared in 1942, and the examples adduced in the systematic chapters are essentially species that are at present of economic importance in the United States. A selected bibliography is appended to each chapter.

London School of Hygiene and Tropical Medicine. **Memoir No. 11. History of the School of Tropical Medicine in London (1899–1949)** [Manson-Bahr, Philip (C.M.G., D.S.O., M.D., F.R.C.P.)]. pp. xiii + 328, 31 illustrations. 1956. London: H. K. Lewis & Co., Ltd., 136, Gower Street, W.C.1. [50s.]

Today it is difficult to visualize the time when no schools of tropical medicine existed, and when the medical curriculum included no special instruction on diseases of warm climates. Manson, from his own experience with beriberi, was keenly aware of the evils resulting from this neglect, and was insistent that a systematic study of tropical maladies and possible means of control would be of enormous benefit, not only to Europeans living abroad, but also to the indigenous inhabitants of these disease-ridden countries. As a small start it was agreed, on Manson's own initiative, that he should deliver an annual course of lectures on tropical medicine in St. George's Hospital, and this began in 1894.

The ravages of tropical disease had been the subject of great concern to Joseph Chamberlain, then Colonial Secretary, who wrote that he had noted the high death rate among Europeans in British West Africa where, in 1895, of 175 officials on the Gold Coast 17 died and 24 were invalided during the year. The mortality among the non-official European population of the tropical colonies was at least as high, and sometimes much higher. Sir Philip relates a grim story of an important despatch sent from the Gold Coast to the Colonial Office, but before this had reached Whitehall, the secretary who drafted it, the clerk who copied it, and the Governor who signed it, all were dead.

Manson's scheme for the establishment of a school of tropical medicine gained an eager supporter in Chamberlain, who addressed memoranda on the subject to the Seamen's Hospital Society and the General Medical Council; as Colonial Secretary he secured substantial grants from the Government; and, at a banquet over which he presided, a sum of £12,000 was subscribed. In spite of the storm of controversy and hostility aroused in 1897 by Manson's famous address at St. George's Hospital—when he denounced the wrongful diagnosis of tropical diseases in London—his cherished dream came true in October 1899, with the founding of the School that will ever be associated with his illustrious name.

Sir Philip continues his narrative by recounting in most interesting detail the subsequent and varied history of the School, its ups and downs, its disappointments and successes, and the great contributions to knowledge made by so many members of its staff. There are chapters, among others, on the School Library, the School Museum, the Bureau of Hygiene and Tropical Diseases, and the Hospital for Tropical Diseases; in this last, the author laments the lack of consistent policy, and the infirmity of purpose, that long hampered the institution, so that, as he says, it developed into a sort of battledore and shuttlecock of medical politics.

Some 150 pages of the volume are devoted to biographies of the founders of the School and of later members of the staff of all degrees of importance. These are written in a vivacious fashion and show much shrewd observation; they are enlivened by many entertaining anecdotes illustrative of the character or foibles of the subject, and often pointing some wise moral. Most of these biographical notes are headed with a little descriptive excerpt from some English classic, and the hunt for an apt quotation for each must indeed have been a long one. Sir Philip's own biographical note has been contributed by Dr. Charles Wilcocks, and ends with a vivid and happily-worded pen-portrait.

Apart altogether from the actual writing of the book, the search for the many illustrations and the collection and assemblage of a multitude of data must have involved vast labour and expenditure of time.

In other and less practised hands the resulting history might readily have developed into a dreary catalogue of facts and figures, to be consulted on some particular point, and then returned once more to its

shelf. As it is, however, the breezy and graphic style of writing carries the reader easily along and this, together with the author's instinct for narrative values, makes it hard to lay the book aside once it has been opened. Only an enthusiast with a deep affection for the School could have shouldered the burden of producing this book with all its mass of detail; but it is easy to see that throughout it has been a labour of love. If the interpolated biography of Sir Philip himself had been headed by some quotation particularly applicable to this history, " The labour we delight in, physics pain " might have been an appropriate choice.

W. P. MacArthur

STEPHENSON, Hadley C. [D.V.M.] & MITTELSTAEDT, Stanley G. [Ph.D.] [Editors]. **Veterinary Drug Encyclopedia and Therapeutic Index. A Listing of Veterinary Drugs, Biologicals and Foods of American Manufacturers.** 4th Edition. pp. vii + 374. 1956. New York 36: Drug Publications, Inc., 49 West 45th Street. [$7.00.]

This fourth edition contains references, in alphabetical order, to nearly 2,000 drugs, biological products and foods; more than 500 have been added since the third edition was published. Each substance is described (often in considerable detail) and where appropriate there are notes on its action and uses, administration, and supply. The makers are named. Most of the substances are listed under their proprietary names, in alphabetical order, and various preparations of the same substance (for instance penicillin) are sometimes, therefore, widely separated. However, a therapeutic index at the end draws like to like, and this is well prepared; it contains such useful sections as Dermatitis Therapy with 1½ pages of entries, and Fungicides with almost a column of entries, and many others. There is also a Manufacturers' Directory, with lists of the preparations they sell.

The book should be useful to veterinarians, but Antrycide, dimidium bromide, phenanthridinium compounds and Stibophen are not mentioned; the authors no doubt, had their eyes on the American scene.

Charles Wilcocks

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